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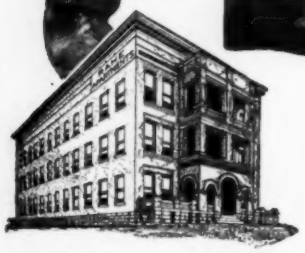

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VOL. 34 DECEMBER, 1920 No. 6

RIGID FOUR-WHEEL TRACTOR HAS NOVEL ACTION

BECAUSE the designers of tractors are not hampered by the conventional restrictions that hold the motor-car engineers in check, valuable and original mechanical ideas continue to appear in new tractors, in spite of the number already on the market. Now a California manufacturer has succeeded in gaining, in a four-wheel tractor, most of the flexibility and other advantages of the endless-tread type, by an ingenious construction. The wheelbase is short, and all four wheels, driven with equal power, are rigid in their relation to the frame, steering being done by cutting off the power on one side or the other. Turning, under these conditions, is made possible by the curious form of the wheel shoes, which run across the rims at certain definite angles. When the steering wheel is turned, partly or wholly disengaging a clutch on one side, the wheels on that side slide easily around on the shoes, which act as sleds, and the turn is made almost in a length. Because of the four-wheel drive, stumps are surmounted and ditches crossed practically with the facility of an endless-tread machine.

The Rigid-Wheel Tractor in the Act of Making a Short Turn: The Right-Hand Wheels are Driving, While the Motionless Left-Hand Wheels are Skidded Easily Around on Their Runnerlike Angular Shoes. The Steering Wheel Merely Disengages a Clutch on One Side or the Other

WASTE COTTON MAKES HIGH-GRADE PAPER

ANOTHER tale of the conversion of waste into wealth is that of the development of a process to strip the last vestige of cotton from the seed and convert it into a pulp, said to be in many ways superior to wood pulp for making into fine papers. It would seem that the cotton gin is not so efficient a machine as most people believe, for in every ton of seed leaving the gin there still remains about 200 lb., or 10 per cent, of cotton fiber. Heretofore about 30 per cent of this remainder has been salvaged, by another ginning process, in the form of a very short fiber, known as linters, used in the making of mattresses, and for other purposes where a long fiber is not necessary. However, even after the removal of the linters, approximately 140 lb. of fiber went into the make-up of every ton of seed. This small quantity has been considered as worthless and has been left on the seed, forming a useless filler in the stock foods into which the crushed seed is made up after the oil has been expressed. The problem of how to salvage and utilize this remainder has been solved by a southern concern, and an enterprise has been organized and is now in operation having as its object the removal of the last coat of cotton lint and the reducing of it to a pulp by a caustic digestion process. It is claimed that the cotton-pulp-base papers are not subject to deterioration to such an extent as are the wood-pulp papers, for this reason being much superior to the latter for use in the making of books and documents of record. Other purposes for which the cotton pulp is suitable are the making of celluloid, artificial silk, and other materials containing cellulose.

BIG CARGO PLANE INTRODUCES NEW TYPE WING

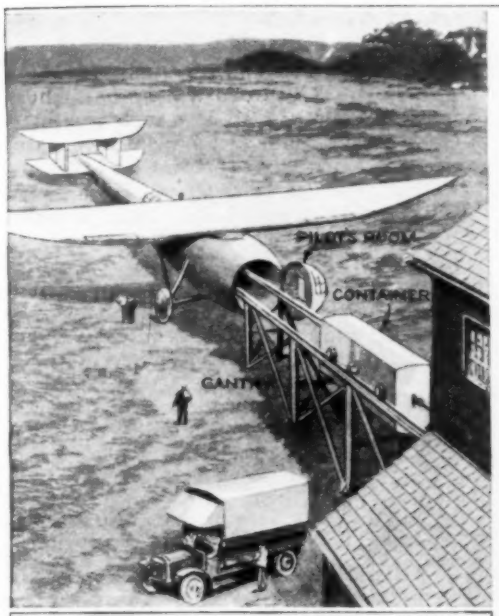
By PAUL H. WOODRUFF

TRAMP ships of the air, huge, slow-moving planes that would be able to make a success of handling freight wherever a cargo may be picked up, have remained so far only a some-day possibility, because of certain principles fundamental to the science of transportation itself. Chief of these is the fact that the cost of load carrying increases in enormous ratio to the speed of the carrier. Freight trains, tramp ships, motor trucks, are relatively slow, each in its class; the airplane is essentially fast. Since the flexibility and adaptability of existing motive power are beyond present criticism, it becomes evident that the new kind of ability, to fly slowly with a heavy load, must originate in the real lifting element of the unit—its wings.

A new and very remarkable wing form is therefore the nucleus around which a British manufacturer is about to construct a mammoth monoplane, whose whole design attacks the load-carrying problem in quite an unusual manner. The span of this giant machine is to be 146 ft., its length 84 ft., and its height 22 ft. The wings are of the cantilever type, constructed of mahogany planking, as is the fuselage also, and without bracing or supports. The most striking feature of the big wings is their bird-wing form, reminiscent of some of the efforts of early experimenters. The trailing edge is straight, but the leading edge curves gradually back to a point at the end, while a deep camber in the center also tapers down at the ends, so that in front view the whole wing resembles an archer's bow.

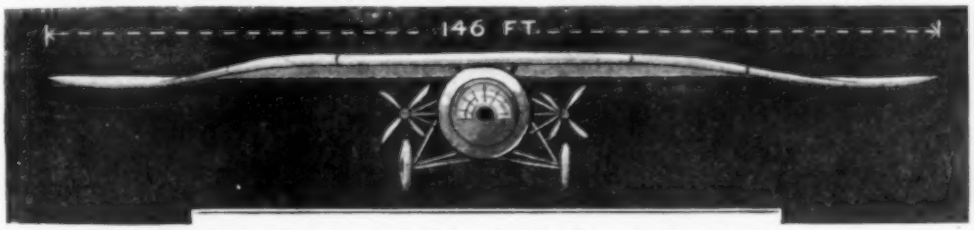
A peculiarity of the wing, so constructed, is that the usual aileron control has no effect upon it. It became necessary, therefore, to devise a new system of lateral control, which consists of a hinged section in the center of each wing's leading edge. Operating one of these flaps increases the resistance and decreases the lift on that side, with the result that the moving of a single lever turns the machine and banks it correctly at the same time, without using the rudder. It was found also that the slip stream from a tractor propeller, flowing over the wings, destroyed their lifting power, and the new cargo plane will have its two pusher screws mounted at the sides of the fuselage, back of the wings.

Though new in practice, this wing type is really the outcome of some nine years of experimental and mathematical preparation. Its feature, of course, is its high lift factor, and the elimination of the usual large losses by vortex action at the ends, giving a straight air flow and a consequent low resistance. A weight-lifting capacity about 35 per cent higher than the average figure results, and the moderate

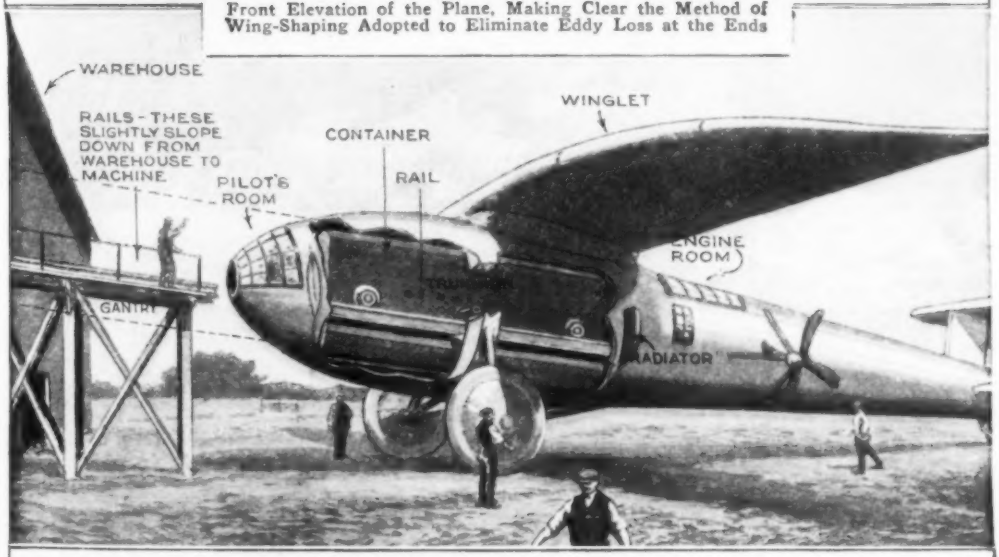


The New "Tramp Ship of the Air" being Loaded with Cargo, Packed in Containers That Fit the Fuselage, through the Open Front Section

The Birdlike Appearance of the Big Cargo Plane in Flight is Emphasized by the Shape of the Wings. Its Speed Is Relatively Slow



Front Elevation of the Plane, Making Clear the Method of Wing-Shaping Adopted to Eliminate Eddy Loss at the Ends



In This Close-Up View, the Hinged "Winglet" Section in the Center of the Leading Edge is Indicated, the Device That Steers and Banks the Plane without Use of the Rudder. The Position of the Propellers and Engine Room, and the Ingenious Method of Loading, Also are Made Plain

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cruising rate of only 72 miles an hour is made possible for the big freighter. Two 450-hp. engines will be used to drive the propellers, and with them it will climb 410 ft. a minute. But it will fly, and climb 40 ft. a minute, on one engine alone, assuring reliable service. The landing speed is 55 miles an hour.

A noteworthy feature of the plane is that its engine room, between the propellers, will be in constant charge of an engineer. The pilot's cage is in the extreme forward tip, the whole of which opens on hinges to give access to the cargo hold. All goods will be handled in containers that fit closely into the fuselage, so that a load can be taken on or discharged while the plane is refueling. The cargo space is 1,700 cu. ft., and the load-carrying capacity four tons. Loaded, and with its crew of two, the machine will weigh 24,100 lb., the wings alone accounting for 5,100. All calculations have been made with so large a safety allowance that a performance even better than indicated is practically certain.

PORTABLE RADIOTELEPHONE IS COMPACT AND SIMPLE

The pocket telephone has been brought a step nearer by the assembling of the necessary radiophone apparatus into a

This New Wireless-Telephone Set Weighs Only 60 Pounds. It Operates on Two Six-Volt Storage Batteries. The Oscillator and Rectifier Bulbs Are Standard

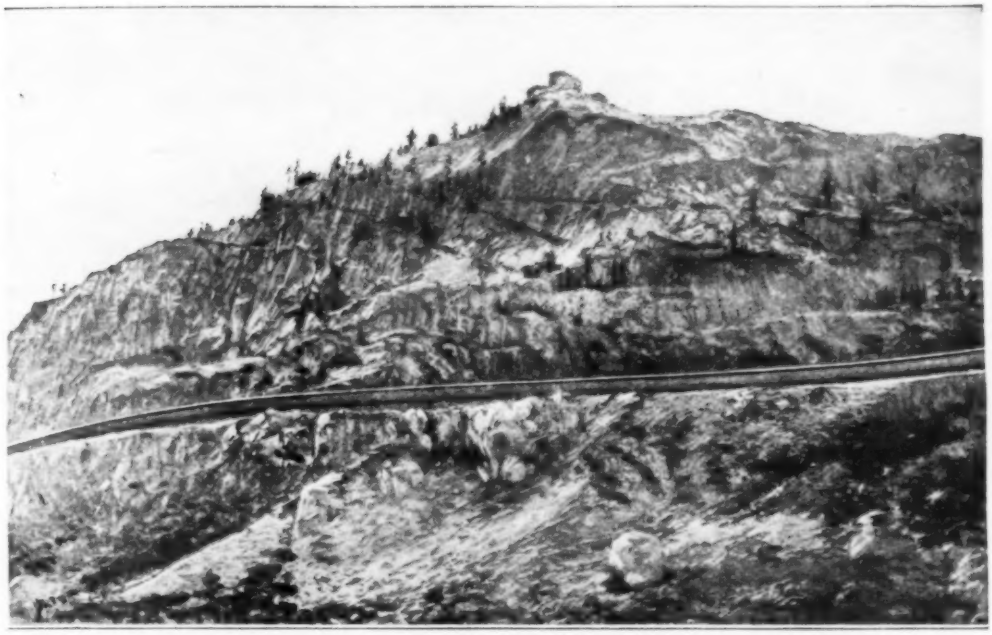
compact unit having a weight of about 60 lb. As a potential of only six volts, to each, is required to operate the rectifier and oscillator bulbs, the low-capacity "B-type" batteries are dispensed with. The low voltage required is available almost anywhere, as two six-volt batteries are easily procurable from any automobile battery service station. The new unit is especially designed for the use of motorists, yachtsmen, campers, and isolated farms. Under ordinary conditions it is said that the new instrument may be depended upon to operate satisfactorily over distances of from 5 to 15 miles. When all transmission conditions are favorable, distances exceeding the latter may be covered. Temporary telephone lines on large construction undertakings may be supplanted by the wireless phone.

BUILD ENORMOUS MASONRY DAM TO SAVE CROPS IN INDIA

With the object of saving crops and averting the terrible famines of the region's past history, the construction of huge storage dams in India has been proceeding for years. In the Ahmednagar district of the Deccan, east of Bombay, a masonry dam now being completed at Bhandara reaches the enormous height of 270 ft., and 85 miles of canals will be necessary to utilize the water for irrigating 75,000 acres of Ahmednagar land. At Bargha, farther south, another great dam is being built for watering 125,000 acres in the districts of Poona, Satara, and Sholapur. A still larger project is the Nira right-bank canal, now nearly ready, which cost about 20,000,000 dollars.

HERO SON OF GREAT AMERICAN HONORED BY RENAMED TOWN

Unusual tribute was paid to an American fighting man when the town of Bismarck, Pa., recently changed its name to Quentin, thus combining honor to the son Theodore Roosevelt lost in battle, and escape from an older cognomen of harsh memory. A patriotic society of the state has erected a tablet commemorating the event, on which is quoted the great American's famous creed of life and death, beginning "Only those are fit to live who do not fear to die." The citizens of the renamed town have been presented, by Mrs. Roosevelt, with a silver loving cup of more than ordinary beauty, inscribed, "Quentin, Pennsylvania, in Memoriam Quentin Roosevelt."

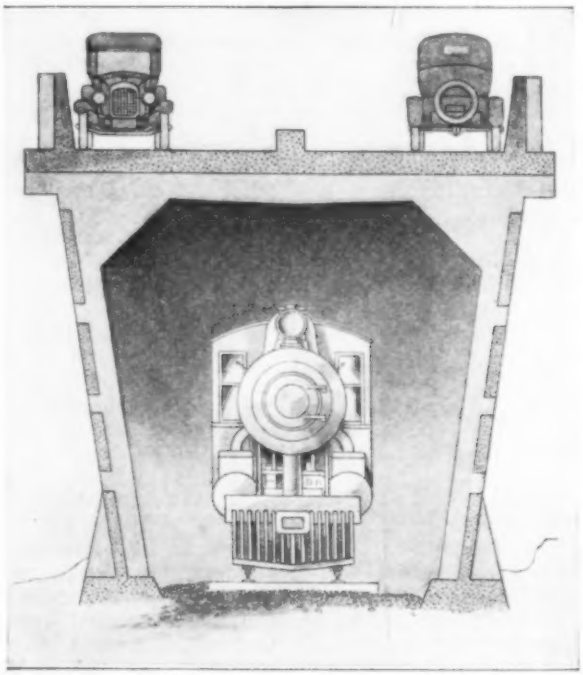


A View, from the Lincoln Highway, of the Present Line of Snowsheds on a Transcontinental Railroad through the Sierra Nevada Mountains: Concrete Construction would Enable Autos to Run on the Roof

PLAN AUTO ROAD ON RAILROAD SNOWSHEDS

Ingenious plans whereby a smooth concrete auto road may be run for 33 miles through a difficult pass of the Sierra Nevada Mountains, and a great transcontinental railroad may acquire, at the same time, a system of permanent concrete snowsheds, have been completed by a western engineer. The design for the new snowsheds provides them with a continuous flat, walled roof, on which autos could run with the assurance that they would encounter no heavy grades or dangerous curves.

At the point under consideration, the track is paralleled, at an elevation of 5,000 to 7,000 ft., by the Lincoln Highway, which is blocked by deep snows for five months of the year. By transferring this link in the thoroughfare to the snowshed roofs, a little clearing work would enable autos to run practically all winter. Excessive first cost heretofore has prevented the construction of concrete snowsheds at this point, in spite of the large depreciation and fire loss on the present wooden structures. But with Federal and state aid on the highway part of the project, the burden of the railroad would be greatly reduced, and early construction encouraged. A large saving in maintenance costs would result for both.



Cross-Sectional View of the Proposed Concrete Snowshed, with an Auto Highway, Protected by Walls, Running on the Roof as a Part of the Lincoln Highway

Panorama of St. Michael's Indian Village, Wyoming, Looking from the Site of the Chapel: In the Center of the the Idea was Abandoned, Because Wells Are Not Always Convenient to Camps, and the Brought from the River, a Mile Away, in Tank Wagons. The

CIRCLES GIVE ARAPAHOE INDIAN VILLAGE RACIAL APPEAL

BY FLETCHER STEELE

THE city planner finds that the fundamental difference between the red man and the white lies not in their color but in their minds. The white man thinks in terms of squares; the red man, in terms of circles. Our towns have straight, usually parallel streets which cross each other regularly at right angles. Our houses are made up of one or more rectangular boxes joined at side or top. Our rooms are square or oblong. Our fireplaces are square holes cut out of the walls.

Indian tepees are arranged irregularly about a more or less round open area. Instead of being square like our houses, they are round. They rise to a point, cone-shape, round in section from top to bottom. Their fires are built in the open, and their people gather around it in a great circle.

St. Michael's Indian village, not far from Wind River, in Wyoming, is being built with an attempt to incorporate in the plan some of these differences between red man and white.

The Door of a Cottage, Painted in Bright Colors with an Individual Sign Representing the Tribal Name of the Occupant

During 1914, Bishop Nathaniel Seymour Thomas told me that the Episcopal Church was about to undertake the construction of a village for the Arapahoe Indians. It seems that President Grant entrusted the welfare of the divers tribes of Indians in several states to various churches, and by this allotment the Wyoming Shoshones and Arapahoes became wards of the Episcopal Church. The bishop has studied Indian education and life, as these problems have been met by the U. S. Indian Commission and others. While he found much of value, he became convinced that the housing and education of the Indian had always left much to be desired. He was determined to try a program which would be more sympathetic to Indian nature and more useful in its results. At his request I went out to Wyoming to study local conditions, and later provided a plan which is being carried out as rapidly as circumstances dictate.

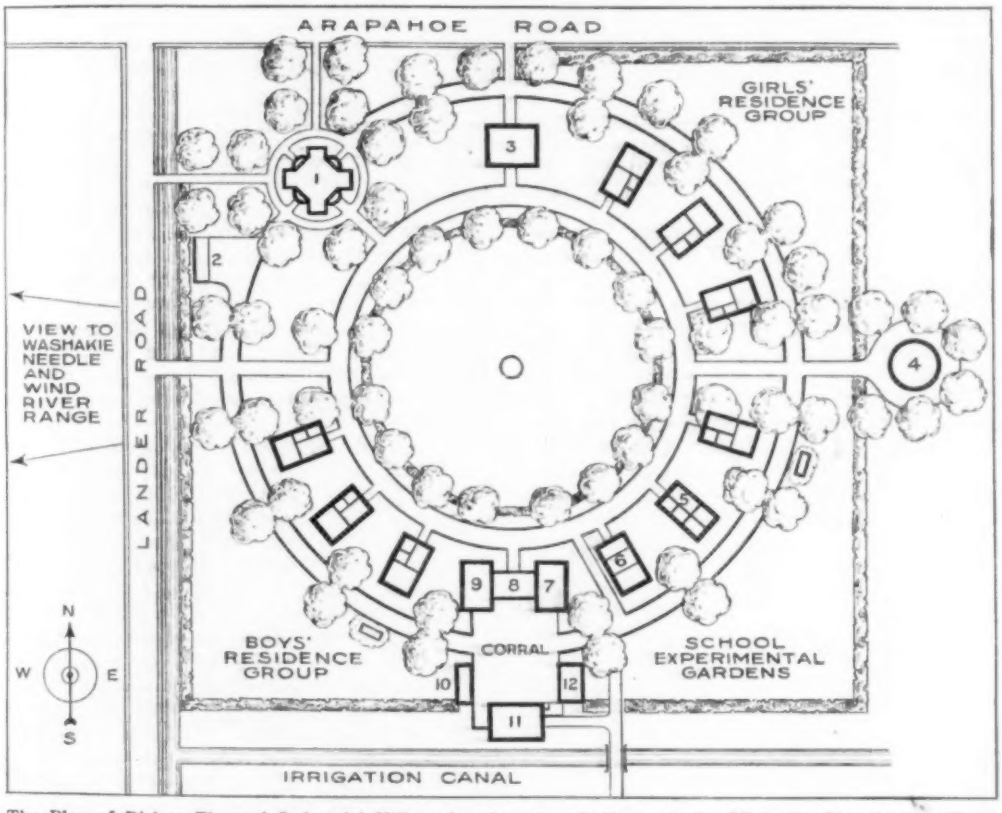
The warden reports that during a recent summer several buildings were erected. (At present nine stone and eight log and frame buildings compose the compound.) Indian work is always slow, and it was naturally felt that it would take many years of work among the Arapahoes to make even a beginning. Yet, for some reason, the whole tribe swung toward the mission. The older people began to crowd in. They called the mission their "Arapahoe home." The first word with which they greeted the workers was "hethadee," and strangely enough, that word, Anglicized "ethete," has been chosen by the government as

Circle, Which Represents the Motif of Indian Thought, Is a Flagstaff. There was to have Been a Well There, but Indians must be Taught to Go Far for Good Water, If Necessary. The Village Supply is Building at the Left Is the School; at the Right Are Cottages

the name of the mission postoffice. It is the Arapahoe word meaning "good" or "good place."

St. Michael's is primarily for the young folks during their years of adolescence. But the needs of all the tribe, old and young, have been studied, in order to provide a permanent center for all Arapahoes.

The young are to have a sort of boarding school, though they need no course in horseback riding, and teaching of French and music is omitted. The old-fashioned way would be to house large groups in one or more big buildings. It is the cheapest, but not the best way to do. Big buildings have big common baths and dormitories, kitchens and din-

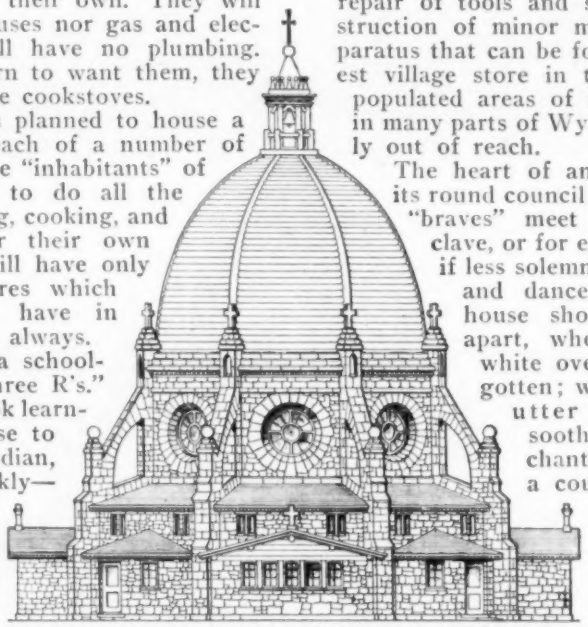


The Plan of Bishop Thomas' Industrial Village for Arapahoe Indians: 1, St. Michael's Chapel; 2, a Horse Shelter; 3, the School; 4, the Warriors' Council House; 5, the Glebe House; 6, the Store and Icehouse; 7, the Machine Shop; 8, the Blacksmith Shop; 9, the Carpenter Shop; 10, the Implement Shed; 11, the Stable, and 12, the Saddlery. Inclosed by the Inner Circular Roadway Is the Open Common, at Its Center a Tall Flagstaff. On Two Sides Are Public Highways

ing rooms. In them the girls may learn to do one or two things which would make them good help in a summer hotel, but that is not the life that awaits them. They will each in time have a small, very humble home of their own. They will not have city houses nor gas and electricity. They will have no plumbing. Unless they learn to want them, they will not even have cookstoves.

St. Michael's is planned to house a small group in each of a number of small houses. The "inhabitants" of each house are to do all the washing, sweeping, cooking, and other chores for their own "home." They will have only the simple fixtures which they can easily have in their own homes always.

There will be a schoolhouse for the "three R's." But extensive book learning is of little use to the average Indian, who forgets quickly—reverts easily, one is tempted to say. Community interests and individual competition are more useful. So the school will be used as a community building. The real school for the girls will be the "homes" they live in.



The Future St. Michael's Chapel, Laid Out on the Greek-Cross Plan, and Constituting the Red Man's "Stone Wigwam," Domed to Represent the Thought of the Native Tepee; It will Not be Built, However, for Some Time

The school for the boys will be the typical Wyoming farm connected with the village. Farming and dairying will be done along simple practical lines, to impart a real training for the life they will lead as men. Working with the farm are a series of shops, blacksmith, machine, saddlery, sloyd, as well as an icehouse, store, and dispensary. Here the boys will learn to meet the usual contingencies of western farm life, the forging of horseshoes, the making of wagon wheels, the repair of tools and saddles, the construction of minor machines and apparatus that can be found at the nearest village store in the more thickly populated areas of the country, but in many parts of Wyoming are entirely out of reach.

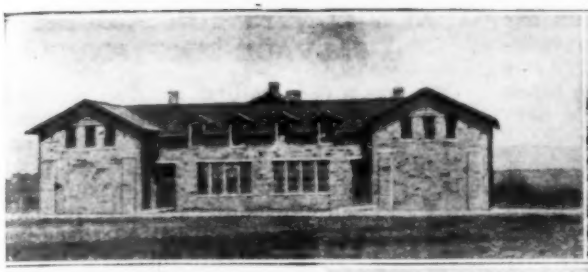
The heart of an Indian tribe is its round council house, where the "braves" meet in solemn conclave, or for equally important, if less solemn, tribal mysteries and dances. The council house should be a thing apart, where the sign of white overlordship is forgotten; where the sting of utter defeat can be soothed by strange chants. There will be a council house.

But while a sympathetic guardian in the person of a Christian bishop is glad to provide a council house, he must be equally quick to counteract any unwholesome, heathenish practices that may be indulged in by the frequent backsliders. He must furnish a constant inspiration to the sincere Christians among his ruddy flock. There must be a church—"Our Father's House," as it is already known—among the other houses of the village.

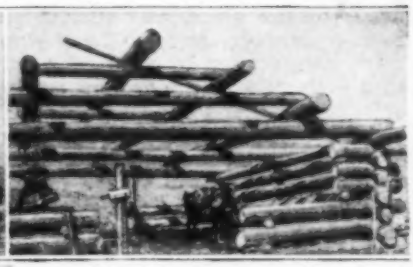
The land on which the buildings are to go is part of a great irrigated plain, located at one corner of two important crossroads. In the distance rises the Washakie Needle, constant reminder of a great Arapahoe chieftain. Other peaks and ranges mark the horizon like a string of huge opals around a plate. It is an inspiring site for a town, which offers no peculiar local difficulties.

The Humble but Serviceable Chapel That Serves for the Present in Place of the Edifice Planned for the Future: Its Remarkable Feature Is a Rear Window of Clear Glass, That Frames the Distant View of Great Chimney Rock, 14,000 Feet High, and Makes of It a Decoration for the Chapel Wall

Two concentric circular roads fix the schematic arrangement of the vil-



The Building That Houses the Boys' Machine, Blacksmith, and Carpenter Shops: The Long, Low Wyoming Architecture is Followed in Its Design

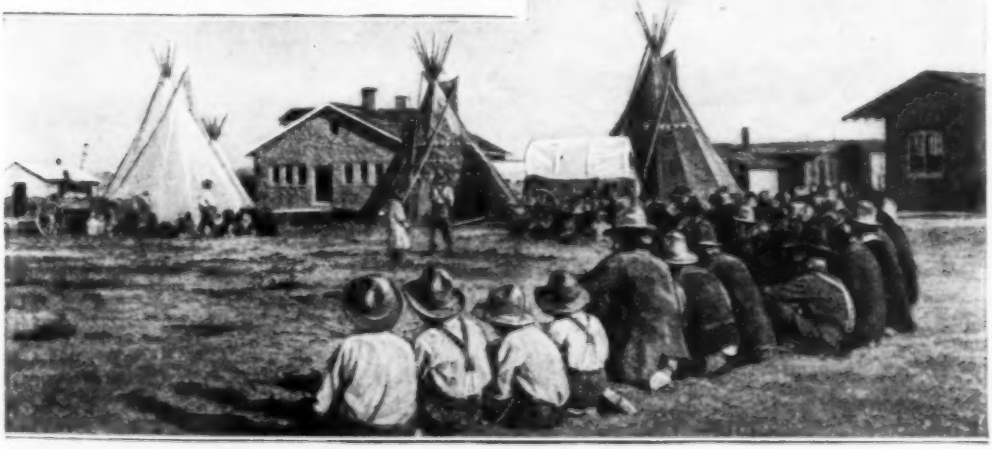


Beginning One of the Log Buildings for the Village, Showing the Wyoming Method of Log-House Construction

lage. The center, marked by a flagpole, is located about 400 ft. from the through highways. There will be no buildings in the common marked by the inner road. It will be kept open for games, exercises, and pageants. The

In the Foreground Are Three Comanche Tents, in the Background the Industrial Building, and at Its Right, One of the Villagers' Cottages

Above: A Council of Arapahoe Chieftains at the Indian Village. Below: The Event of the Bishop's Feast, with the Braves and Their Youth Gathered about the Green, and Prairie Wagons and Tepees Mingling in the Background with the Substantial Structures of the Glebe House, the Store Building, and at the Extreme Right, the Shops



houses and most of the other buildings lie between the inner and outer roads.

The triangular ground between the crossroads and the circle is dedicated to the future church, which will have a neighborhood as well as local function to fulfill. While a circular building following the precedents of old Italian baptistries might have been worked into the location, the Greek-cross plan is better fitted to the

needs of the place, and such a plan has been proposed. It is to be a stone wigwam, surmounted by a dome to carry out in a general way the feeling of the tepee in "Our Father's House." As this permanent stone church will not be erected for some years, a small chapel has been built on one of the house sites. It is notable for its careful orientation and the clear-glass window built behind the altar, which bring the Great Chimney Rock, nearly 14,000 ft. high, literally into the church as a reredos decoration.

The school is next to the proposed church on the public highway. The shops, store, and farm groups are on the opposite side of the circle where they are most accessible to the farm. The council house is related to the scheme, but located without the confines of the village proper, which is hidden behind trees and hedgerows.

Practical difficulties make it impossible to plan all the buildings round. A round structure is not economical in plan when it comes to division into various rooms. So, the average village buildings are oblong. Their distinction depends on their long, low lines and almost flat roofs, which follow the old Wyoming precedents. Even two-story houses and ordinary barns stick up like sore thumbs in the flat, clear, telescopic distances of the West. Simplicity and sturdiness, with proportions and lines following local examples which were based on practical experience of climate, wind, and snow, have guided the design of the buildings.

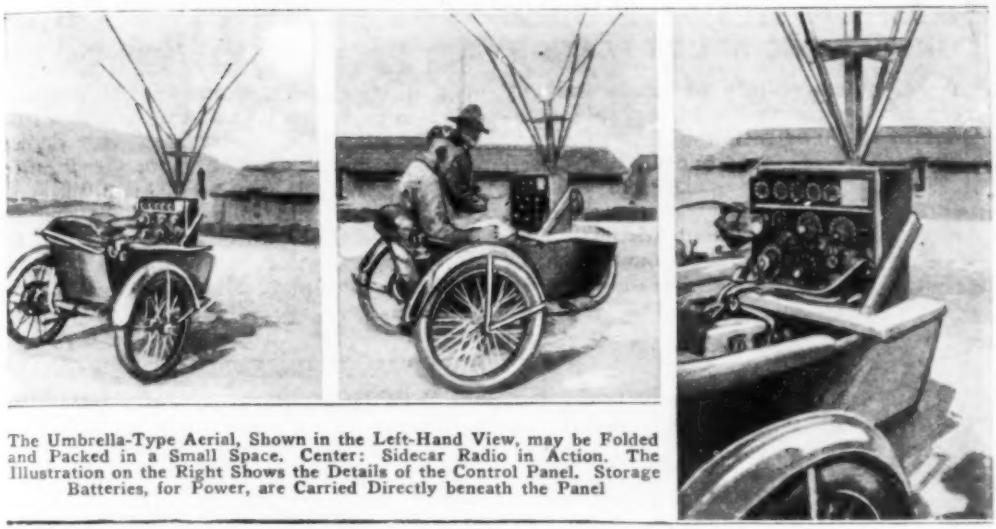
Bringing in Material for the Construction of the Indian Village: The Wyoming Roads Are Far from Good, and It Required a 10-Horse Team to Pull the Wagons over the Long Stretches of Alkaline Plains

NEW CONVERSION PROCESS TO SALVAGE SHOP SCRAP

An improved method for the reclamation of lathe turnings and other machine-shop steel scrap has been evolved. The metal is first pressed into slugs and given one or more light heats. The slugs are next pressed into billets, which may be heated and drawn or rolled into bar forms. It is stated that metal reclaimed by this method is characterized by a tough, fibrous structure and a high elastic limit, making it particularly useful for the production of such articles as brake bands, etc. It is also said that the system is especially valuable when applied to the salvaging of the nickel-chrome, vanadium, and other special alloy steels, as the conversion cost is small.

COMPACT WIRELESS SYSTEM INSTALLED ON SIDECAR

An officer of the Signal Corps, to whom is credited many improvements in army radiotransmission, has lately developed a wireless set, sufficiently compact and light in weight to be installed on a sidecar. It is stated that the effective range, with the car at rest, is about 20 miles, and that it has a record of satisfactory performance over a distance of 15 miles at a car speed of 50 miles per hour. The chief points of interest are the peculiar umbrellalike antenna, made up of heavy copper wire, bent to shape; the counter-



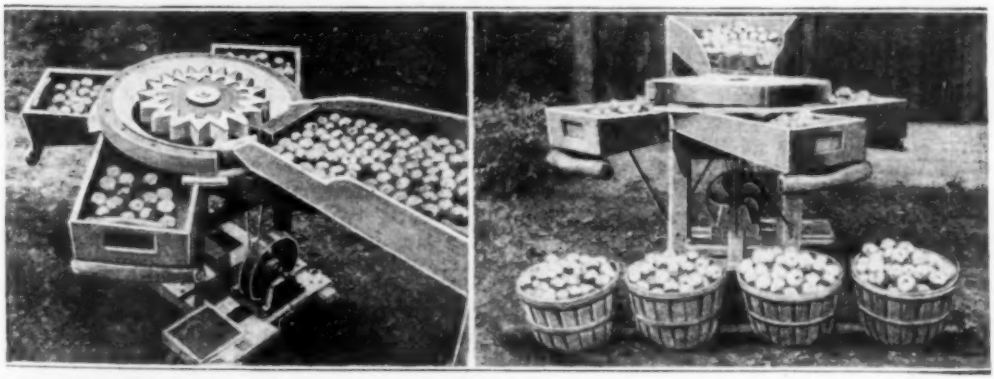
The Umbrella-Type Aerial, Shown in the Left-Hand View, may be Folded and Packed in a Small Space. Center: Sidecar Radio in Action. The Illustration on the Right Shows the Details of the Control Panel. Storage Batteries, for Power, are Carried Directly beneath the Panel

poise, which, being wrapped around the body of the sidecar, has the effect of damping out the confusing impulses set up by the magneto action, and the 300-volt dynamotor which supplies current to the amplifiers. On a recent truck maneuver, two sidecars, one with each detachment, kept in perfect communication throughout the movement. At no time were the detachments nearer than 10 miles to each other.

APPLES ACCURATELY GRADED BY MACHINE OF NEW TYPE

An apple grader, or sizer, that works with extreme accuracy, and is inexpensive and light enough to be easily portable to any part of the orchard, has recently been developed. A horizontal revolving wheel is provided on its periphery with a series of padded, triangular notches into which the apples fall by gravity from a chute. Encircling the notched wheel is an adjustable hollow table, or sizing base, that slants toward the center; this base has a spiral-shaped opening which enlarges gradually. All diseased and malformed fruit and dirt are removed by hand on a sorting table, and the rest are fed to the grader. Padded boxes underneath the machine receive the various grades of fruit. The machine can be operated by foot power and can be built to any capacity.

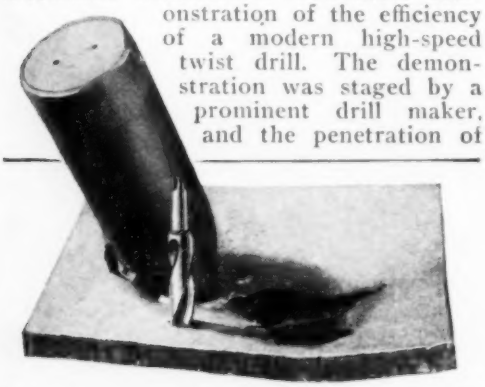
¶ By arranging electric lights to produce a simple imitation of dawn, the captive birds of the London Zoölogical Gardens are now induced to breakfast at any hour their keepers think best. It is stated that game birds may be fattened in this manner, by providing an artificial dawn and twilight as often as once an hour.



Left: The Apple-Grading Machine Receiving a Mixed Load of Apples, Which Its Toothed Wheel is Sorting into Various Boxes. Right: Four Baskets of Apples of Graded Sizes, Taken from the Machine Boxes

DRILL COMPETES WITH SHELL IN PIERCING ARMOR PLATE

A recent convention of master railway mechanics witnessed a remarkable demonstration of the efficiency of a modern high-speed twist drill. The demonstration was staged by a prominent drill maker, and the penetration of various metals at different feeds and speeds was startling. Using a 1¼-in. drill at a spindle speed of 720 r. p. m. and a .1-in. feed per revolution, the penetration in cast iron was at the rate of 72 in. per minute. Machinery steel was drilled through at the rate of 30 in. per minute, with a 1-in. drill, making 600 r. p. m., with .05-in. feed; and operating at a spindle speed of 230 revolutions and a feed of .04 in. per revolution, a 1¾-in. drill penetrated armor plate at the rate of 9.2 in. per minute.



Demonstrating the Efficiency of a Modern Milled High-Speed Twist Drill before a Convention of Master Mechanics: A Penetration of 6 Feet per Minute in Cast Iron was Obtained; Machinery Steel was Drilled Through at the Rate of 2½ Feet a Minute, and Armor Plate at a Speed of 9.2 Inches

RAILWAY BRIDGES PROTECTED BY CONCRETE BRINE TROUGHS

As much damage is being done to steel railway bridges as a result of brine from refrigerator cars attacking the metal, a narrow concrete trough, placed midway between the rails and designed to catch the objectionable fluid, is being installed on all steel bridges of a Michigan railroad. Concrete is unaffected by salt solutions.

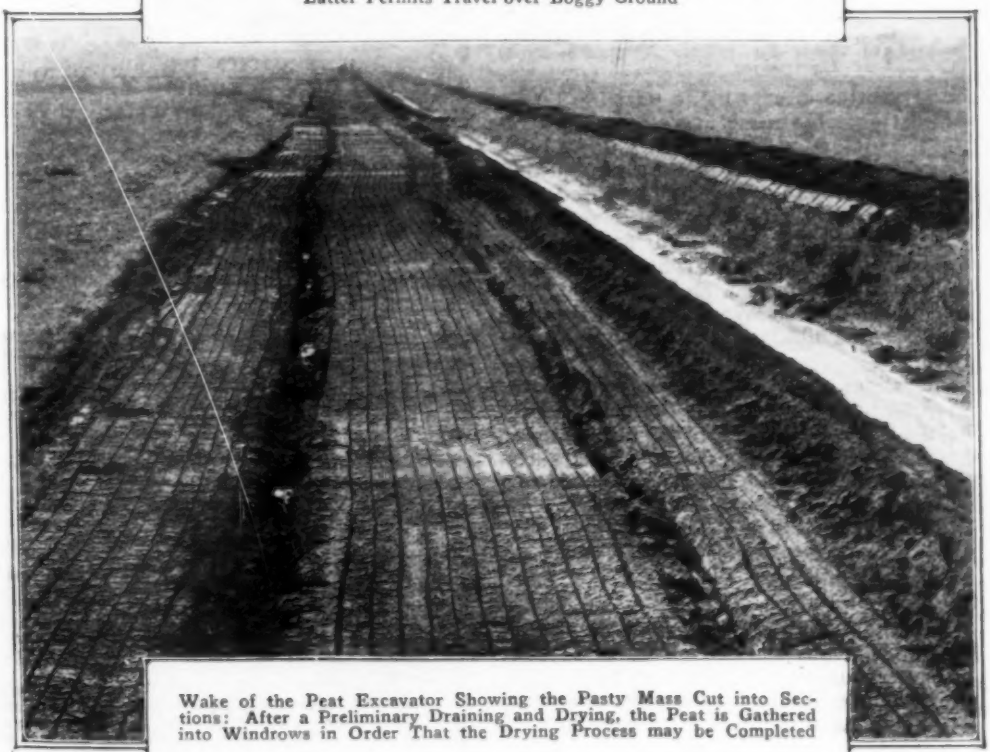
POWERFUL PEAT EXCAVATOR DIGS 700 TONS PER DAY

A new machine built on the endless-track principle, designed especially for the purpose of excavating peat, conveys some idea of the proportions to which this industry has grown. Quantity production is aimed at by the new method of peat excavation and preparation. Whereas, by the old processes, the average yield per man per day was about one ton, one man with the power excavator, which is now in use in a Minnesota peat bog, digs, mixes, spreads, and forms 700 tons of raw briquettes per day, corresponding to 100 tons of the dry fuel.

The excavator proper consists of a worm conveyor having cutting edges on the outboard end. This unit digs to a maximum depth of 7 ft., conveying the mass to a macerator, where it is ground and churned to a paste. The operation is continuous, the paste next being discharged upon the ground and spread in a uniform layer, about 16 ft. wide by 4 in. thick, by a spreader, which also cuts it into narrow ribbons. Another machine then cuts these into easily handled briquettes. After a preliminary drying the briquettes are arranged in windrows that the drying process may be completed. The excavator is powered by a gasoline engine and is completely self-contained and self-moving. The extreme width of the tread enables the heavy machine to travel easily over the soft, marshy ground, where it would be impossible to move a wheeled vehicle.

Engineers of the Bureau of Mines, University of Minnesota, are authority for the statement that there are sufficient peat deposits in sight to supply all the fuel requirements of the state for hundreds of years at the present consumption rate. As the coal-distribution problem in the northern and northwestern states is becoming increasingly difficult from year to year, the above statement is received with satisfaction by the inhabitants of these regions. Combustion tests, conducted by an expert, have demonstrated that the most efficient way in which to burn peat is in the pulverized form, using the same air-blast equipment as in firing pulverized coal. Peat burns with a gas-like flame, leaving very little ash. The tests resulted in the finding that peat burned in this way develops 90 per cent of the efficiency of pulverized coal, and is nearly twice as efficient as coal stoked by the hand method. Burning peat in the pulverized form is a new development. This, coupled with the great capacity and low operating cost of the excavator, puts peat on a better than even footing in competing with coal—the cost of production, and consequent selling price, being about one-half those of coal.

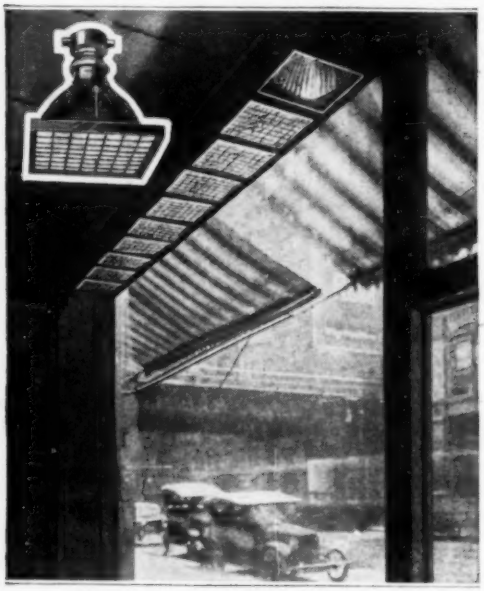
Details of the One-Man Controlled Peat-Excavating Machine: At the Left Is the Long Tube Containing the Conveyor and Digging Screw; the Unusual Width of the Endless Track is Also Plainly Shown. The Latter Permits Travel over Boggy Ground



Wake of the Peat Excavator Showing the Pasty Mass Cut into Sections: After a Preliminary Draining and Drying, the Peat is Gathered into Windrows in Order That the Drying Process may be Completed

USE GELATIN COLOR SCREENS FOR SHOW-WINDOW LIGHTS

Various technical obstacles have heretofore prevented the extended use of colored lighting for display windows, despite



Display-Window Reflectors Fitted with Slides of Colored Gelatin: In the Nearest One the Slide is Removed to Show the Frame. They are Easily Changed or Combined

the attractive effects made possible by its application. Manufacturers of a lamp reflector much used for show windows have now devised a simple metal frame which holds a removable sheet of colored gelatin over the mouth of the reflector, that material having been found eminently suited to the purpose. The gelatin, in the form of a slide, is supported by a mesh of fine wire, and an asbestos-cord harness holds the frame on the reflector.

The slides are readily changed or combined to produce any tint desired, and by the use of a flashing switch, alternate or successive color changes may be automatically made. The effects produced are not confined to the positive colors, and the subtle shades of moonlight, dawn, and other special conditions, are easily simulated.

¶A cabinet phonograph only 5 in. high, yet elaborately complete in its diminutive reproduction of a regular model, even to the record-filing cases, has been made by an employe of a mid-West music house.

PLAN DOUBLE-GAUGE RAILROAD FOR AUSTRALIAN SYSTEM

Railroad men of Australia are in the throes of a vigorous discussion as to the most economical and efficient method of extending the present track system, under conditions complicated by the existence of two gauges, 63 in. and 56½ in. Conversion of the whole system to the narrower gauge would cost, it is estimated, close to $450,000,000. The alternative plan is to add a third rail to the lines now in use, giving a double-gauge line from Sydney to Melbourne at a cost of some $24,000,000, without interrupting traffic. To test certain engineering objections, an experimental line is to be laid along a spur from the border of Victoria into New South Wales, and its success will probably determine the future construction policy. The principal difficulty is in laying the third rail through congested centers and yards.

TINY ELECTRIC AUTO IS BOON TO CHILDREN AND INVALIDS

Young children are not allowed to drive regular motor cars, and invalids usually cannot. The restriction is removed, however, by a new electric car of diminutive size, which runs at five to ten miles an hour, and covers ten miles on one battery charge. Its total length is only 5 ft., its width 22 in., and its height 24 in. The little auto is of regulation gas-car shape, with 12-in. disk wheels, 1-in. solid tires, and wheel steer. Right and left-foot buttons give forward and reverse control, and a hand lever operates the brake. Overnight connection to a lamp socket, through resistance or rectifier, charges the battery.

A Complete Electric Auto, Only Five Feet Long and 22 Inches Wide, That Runs Five to Ten Miles an Hour: Overnight Connection to a Lamp Socket, through Resistance or Rectifier, Charges the Battery

PHOTO BY THE GILLIAMS SERVICE

The Extreme Lightness Characteristic of Balsa Wood Becomes Evident When Men Lift to Their Shoulders, and Easily Carry, Huge Logs More than a Foot in Diameter

BALSA—THE LIGHTEST COMMERCIAL WOOD

Paraffin Treatment Gives Material Great and Varied Possibilities, Displacing Cork in Many Instances

BY HARRY A. MOUNT

RECENT successful commercial application of balsa wood where cork has been thought indispensable brings to attention one of the strangest of nature's products. Not only is it the lightest of all known woods, weighing less than half as much as cork, but it possesses as well remarkable elasticity and strength, is unexcelled as an insulator against heat, and has a microscopic structure unlike that of any other wood.

Balsa wood is not a recent discovery. The name balsa, of Spanish origin meaning "raft," indicates that at least some of its remarkable properties were known some hundreds of years ago. It is something of a coincidence that one of the first important uses found for the wood by recent research has been the making of life rafts for ocean-going vessels.

The wood comes from a tropical tree found all over the northern part of South America. It is especially abundant in Honduras, Costa Rica, Colombia, Jamaica, and Panama. Some years ago the cultivation of balsa on another of the West Indian islands was undertaken on a large scale, but was not successful because of the natural limitations of the wood.

Balsa rots very rapidly in the tropics if exposed to the weather, and if dry it is attacked by borers. The wood is useless unless it is shipped a week or 10 days after cutting. At first, when made into articles of commerce, it warped badly and soaked up large quantities of water, becoming water-logged. A process of applying paraffin has recently been developed which overcomes these difficulties. More will be said of this later.

The tree is easy to cultivate, and there is no doubt but that the wood in any quantity demanded will be available for future use. It is entirely a second-growth tree, and is found only where the land has once been cleared, excepting for a few scattered trees found throughout the tropical forests.

The trunk of the tree is smooth, and mottled-gray or white. The leaves of the young trees are thin and broad, often 12 to 14 in. across, supported by stems reaching 18 in. in length. In a single year a young tree reaches a height of about 10 ft., and is about 4 in. in diameter. At the end of the second year it is about 20 ft. high, and at the end of five or six years may tower in the air

from 50 to 80 ft., with a trunk from 20 to 30 in. in diameter. The trees average about 200 board feet of lumber each in five years. They need very little care during the first year after planting, excepting to cut down the tropical weeds which might smother the young plants, and after that no more attention is necessary until they mature.

The trees grow in groups of males and females. The male trees, called "burrillo," although they appear very much like the female trees, or "balsa real," are really useless. They are twice as heavy as the female trees, because they contain more woody fiber. There are also two species of the tree, the white balsa, or "balsa blanca," and the red balsa, or "balsa colorada." The white balsa, as its name implies, is perfectly white when cut, but upon aging turns red. It furnishes the balsa wood of commerce. The red balsa is much heavier, and is a bright red when cut.

In midsummer the female tree blooms. From upright green pods, about 6 in. long, emerge light pink blossoms. Later the pods shrink to about an inch in diameter, half their former size, and about two months after the blossoms disappear, the pods bend down and break into six sections, which open and reveal quantities of a golden-brown cotton. The natives gather this for use in pillows and mattresses. The seeds are arranged in rows within the pods, but they are so small that 22,500 of them are required to make a pound. The seeds are scattered by the wind and take root wherever they find a cleared space.

In the Canal Zone, where thousands of acres were cleared in the fight against the malaria mosquito, the trees have sprung up in great profusion. Many have even taken root and have covered with verdure the great earth slides into the canal.

The wood itself resembles basswood in appearance, although the annual rings, common to most of our trees, are missing. Under the microscope, however, it might be mistaken for the pith wood of elder. Instead of the usual interlacing structure of woody fiber, the wood is composed of tiny barrel-shaped cells of pure cellulose tissue. There is no other known wood with so little woody tissue in it. The cell structure is very thin, and each cell is filled with air. They are arranged in columns which run the long way of the wood. The cells are nearly as wide as they are long, however, and the wood has nearly as much lateral as longitudinal strength.

Tests made by the Bureau of Standards and by Cornell University show that, in spite of the extreme lightness of the material, it is about half as strong as spruce. A plank of the wood, which can be held at arm's length by a man of ordinary strength, will easily support the weight of two grown men. Three specimens, one by three inches, when submitted to crushing or compression tests, sustained loads of 2,210, 2,380 and 2,530 lb. to the square inch, respectively. It is almost impossible to split the wood by driving nails in it, and, in fact, it is the practice, in making some articles of it, to drive in ¾-in. pegs without first boring holes.

The present process of preparing the wood for market completely coats the interior walls of the cells with paraffin without clogging them and without adding any appreciable weight to the wood. It is thus rendered waterproof and immune to warping or splitting.

The logs are first cut up into planks of the proper size, and these are then dropped into a hot bath, the principal ingredient of which is paraffin. The heat of the bath drives off the water in the wood as steam, and then the mixture is allowed to cool, with the wood immersed in it. In cooling, a vacuum is created in the cells and the paraffin is actually sucked into the wood. After cooling, the wood is weighed, and if any appreciable gain in weight is noted, it is put through a heating process which drives off excess paraffin. After the wood has been finally cut to size, it is given another coat of paraffin on the outside to render it completely waterproof. Wood so treated has been immersed in water with cork until the cork was completely water-logged without any noticeable gain in weight in the balsa.

The wood is now used chiefly in the making of life preservers, ring buoys, rafts, and other life-saving equipment for the sea. This is no doubt because an ex-sea captain, who had run across the wood in the tropics, was the first to realize the commercial advantages of the wood and to launch a successful business in it. Constant experimentation, however, is enlarging its field of usefulness. During the war the wood was used as filling for the wings of flying boats, to give them buoyancy in case the machine dropped into the sea.

What promises to be one of the most important uses for the wood is in the manufacture of refrigerators. Balsa is declared by refrigerating engineers to be

almost a perfect insulator against heat. At a recent nautical exposition in New York a refrigerator made of balsa wood was iced at the beginning of the show and closed. Ten days later it was opened and some of the ice still remained.

It is possible that the wood will effect a revolution in refrigerator-manufacturing methods, since the material need not be used merely for insulation, but is strong enough to be a part of the box itself. One large manufacturer, who has already begun to use the product, predicts that some day every home ice box in the country will be made of balsa, and that our ice bills will then be cut in half.

Another important recent development is the invention of a container for shipping perishable goods over long distances. In this case the balsa wood acts just as a vacuum bottle in protecting the goods within from extremes of outside temperature.

Experiments indicate that balsa wood may find an important use also in soundproofing. It may become an invaluable aid to the architect who has upon his hands a difficult problem in acoustics. These uses, and the nature of the wood, suggest almost innumerable future possibilities, but for the present at least rapid development will be hampered by a lack of sufficient raw material. If a large demand for the wood develops, as predicted, there seems to be no great obstacle in the way of obtaining an adequate supply, because of the profusion and rapidity of its growth.

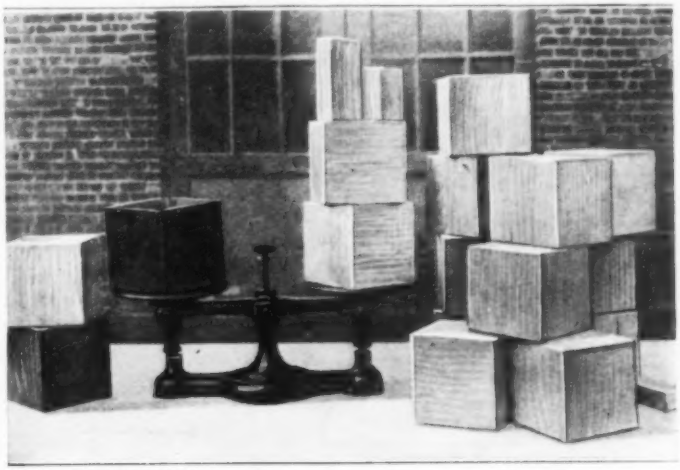


PHOTO BY THE GILLIAMS SERVICE

Put on the Scales, Balsa Wood Weighs Less than Half as Much as Cork, and in the Picture the Cork Cube at the Left is Seen Balancing Those of Balsa at the Right. As a Heat Insulator, Also, the Balsa Timber Is a Superior Substitute for the Cork

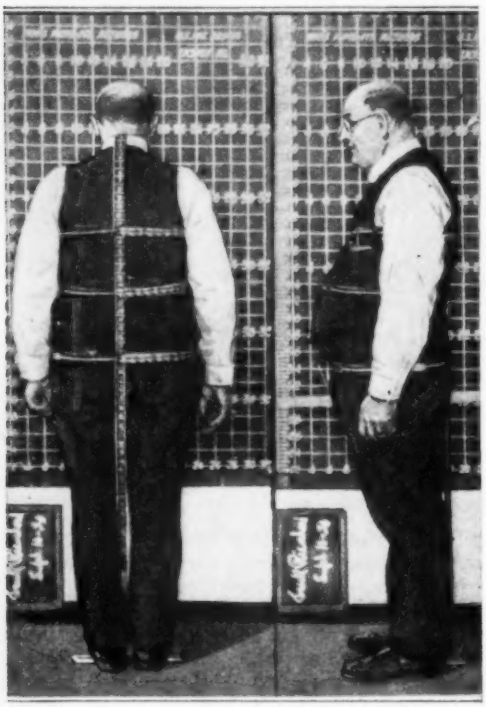
POCKET UNDER THEATER CHAIR HOLDS WRAPS

Although women certainly have a great deal to do with theater attendance, probably being the cause of most of it, until now the little pieces of wire under the seats have been reserved for the hats of men only, and are far from perfect even for that purpose. Now a number of eastern theaters are replacing the inadequate bracket with a new and ingenious pocket in the shape of a bag of stout cloth hung on a wire frame. When the seat is let down, the bag opens, disclosing a capacity for hats, wraps, bundles, and trinkets up to a weight of 75 pounds.

Left: A Theater Chair Folded Up, Revealing the New Capacious Pocket in Place of the Usual Wire Bracket. Right: The Seat Turned Down for Use, with the Pocket Full of Wraps and Parcels

CAMERA SUPPLANTS TAPELINE IN NEW MEASURING SYSTEM

When the new photographic method of measuring is adopted by the tailoring trade a misfit should be a rarity. Low or



Tailor's Measurements Accurately Taken by Photography and Filed for Future Reference: Common Errors are Avoided

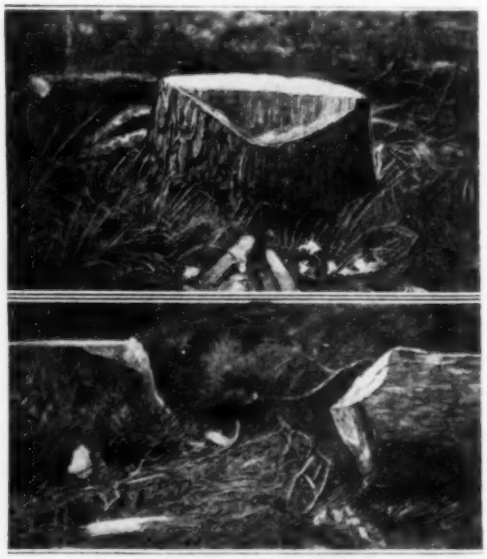
round shoulders will be unerringly recorded by the infallible plate, and the cloth may be cut and joined in such a way that these, and other bodily peculiarities, may be masked or accentuated, whichever may be desirable. It is claimed that misfits, caused by the slippage or stretching of the tape, are entirely eliminated by the new method. Another point of value to the tradesman is that the customer's dimensions are always on file, ready for instant reference and use.

GUIDED BY SUBMERGED CABLE, "BLIND" PILOT STEERS SHIP

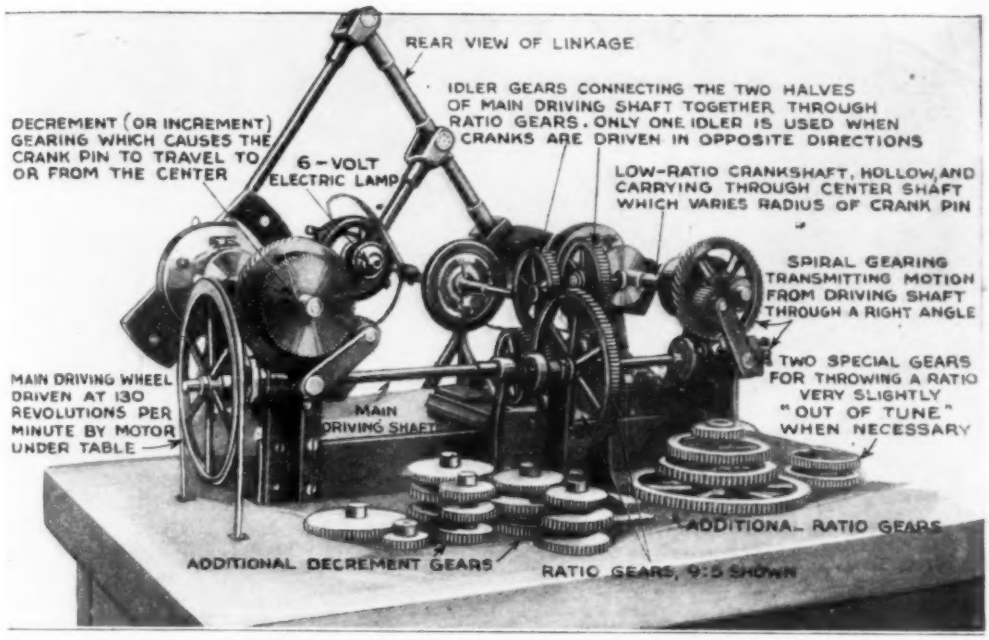
Steered by a pilot who could not see his landmarks, a United States destroyer recently made a crucial and successful test of the new induction-cable method of guiding ships, described in this magazine last April. The cable was laid on the bottom at the entrance to New York harbor, and 500-cycle alternating current of 3½ amperes at 375 volts was used, the signal being the word "navy" constantly repeated in Morse characters. This was caught by two coils on the ship's sides, amplified 400 times by vacuum tubes, and passed to the telephone receivers in the pilot house, the windows of which were darkened with canvas. By comparing the sounds from the two coils, the pilot was able to locate and follow the cable accurately. The signals were audible when the ship was 1,200 ft. from the cable.

NEW METHOD IN LUMBERING DIMINISHES ACCIDENTS

The director of safety of one of the large timber companies states that, of the total number of accidents, causing loss of time to the company and the employes, a large proportion are directly traceable to the treacherous flying back of the tree butt just before the tree reaches the ground. This is known as the "kick-back." The method of avoiding the kick-back is to cut a peculiar triangle-shaped notch at the point where it has been decided to make the felling cut and on the side of the tree opposite to where the felling cut is to be started. If the "V-bed," as it is called, is correctly cut the effect will be to make the whole tree jump away from the stump instead of toward it. It has another desirable effect of insuring a clean break, no splinters being left on the butt.



The Top View Shows the "V-Bed" Cut. Below: The Tree has Fallen toward the Side on Which the V-Bed was Cut

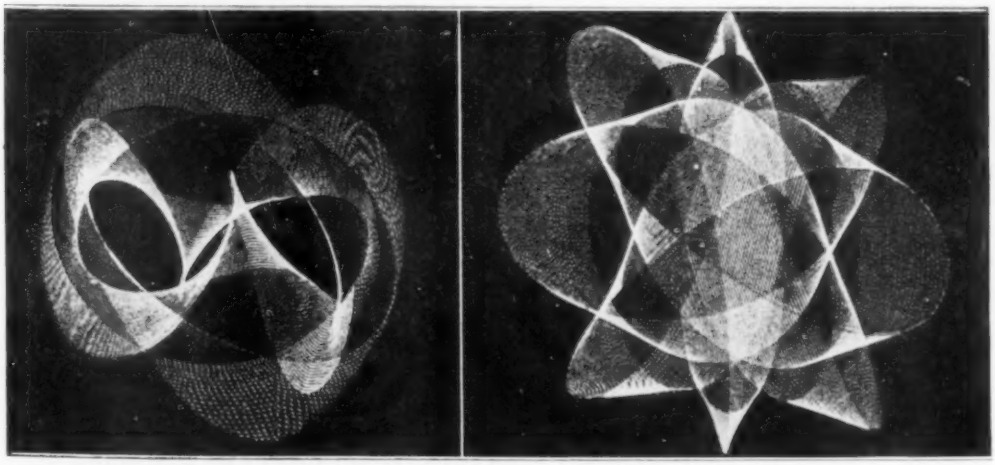


The Photo-Ratiograph, Showing Driving Mechanism and the Numerous Pinions and Gears Used to Vary the Speed Ratios of the Cranks: A Light Beam from a Six-Volt Bulb Makes a Tracing of the Compound Motions of the Cranks on a Photographic Plate or Film. A Hinged Frame Carrying a Light-Tight Box in Its Center is Shown in the Background

VIBRATION RECORDS TRACED WITH LIGHT BEAMS

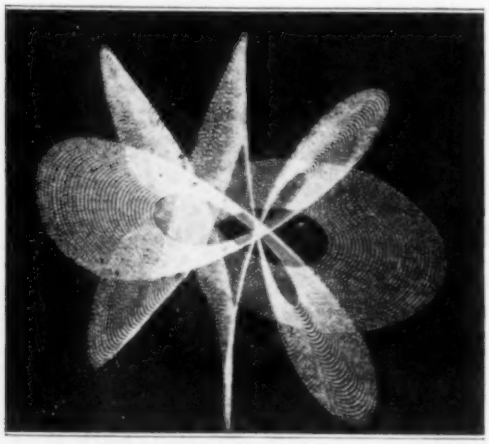
By WM. H. HUNT

THE study of regularly occurring vibrations is of exceeding interest to automotive, electrical, and other engineers engaged in the design of apparatus to be operated at high rotating speeds. This for the reason that the causes of vibrations of objectionable speed rates, or lengths, must be found and avoided in order that as nearly vibrationless operation as possible may be attained. Heretofore the apparatus used to record those motions which, by their regularity of occurrence give rise to vibratory effects, has not been satisfactory. Harmonographs, as they are called, are looked upon by the best authorities on these matters as, at best, scientific toys and not sufficiently accurate to be classed as dependable instruments. These things being true, and there having been a strong demand for a device which would record and reveal the secrets of vibratory rates,



Left: The Tracing with Cranks Reversed, One Varying, the Other Unvarying in the Distance Covered; Ratio, Three to Five. Right: Cranks Turning in the Same Direction, at the Same Rate, with Length of Throws Varying

lengths, collision effects, etc., such a device has been evolved in the form of an instrument called a photo-ratiograph.



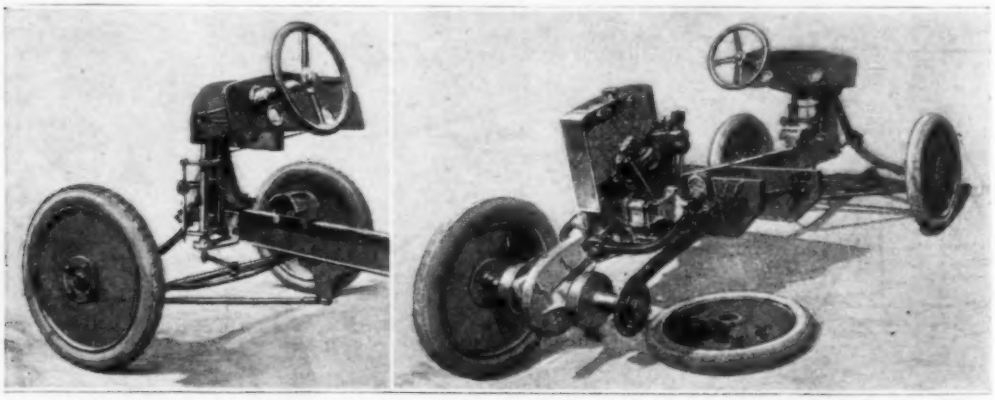
This View Shows the Effects of Cranks Turning in Opposite Directions at Different Speed Rates and with Varying Crank-Throw Lengths

This apparatus is described by the inventor, an English scientist, as an inverted pantograph; meaning that, by an application of the pantograph principle, large dimensions, long lines, large circles, etc., are reduced to small figures and on an exact scale.

Like many appliances used to demonstrate or accomplish complicated problems or results, the photo-ratiograph is simple in construction and operation. A framework, jointed at all corners with ball bearings, thus being free to fold or unfold in two directions, is connected at opposite corners to two adjustable crank throws. In the exact center of the frame is a light-tight box containing an electric bulb. One side of the light chamber is perforated with a pinhole, which allows a pin-point light beam to fall upon a photographic plate, or film, thus faithfully recording every slightest movement of the pinhole. As the movement of the latter will always be the sum of the motions of the two cranks, regularly occurring movements and the way in which they interfere with and balance each other may be studied. Simple vibration records may be made by holding one crank stationary. It is said that the chief value of the device lies in the fact that any vibratory effect may be reconstructed and a record of it taken at any time. The lacelike traceries on the plates remind one of the spontaneous artistry of nature, and it is rather difficult to realize that they are the result of the complex ingenuity of human thought.

RUNNING GEAR WITHOUT FRAME DISTINGUISHES QUEER AUTO

Built entirely without a frame, in the usual sense of the term, the chassis of a new French light auto is remarkable for a number of ingenious departures. A single, straight center beam extends back a few feet from the front assembly and supports two crossbeams, from which the long cantilever rear springs reach back and form the sole support of the entire rear works. The two-cylinder engine is clamped to the center of these springs, and drives the rear axle through a chain. Two transverse cantilever springs, curved up to a high point on a vertical leg of the center beam, support the front end. The steering gear is of the conventional order.



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Left: The Front End of the Frameless Auto, in Which the Curious Springs may be Seen. Right: View from the Back, Revealing the Method of Mounting the Power Plant Directly on the Rear Springs

The Nieuport Plane That Won the Gordon Bennett Cup for France: This Is the Third Time That This Most Famous of Air Races has been Won by a French Contestant. The Machine, Although Built Especially for the Race, is Characterized by Sturdiness of Construction and Reliability. In the Circle Is Sadi Lecointe, Pilot of the Winning Plane

THE GORDON BENNETT CUP AIR RACE IS WON BY FRANCE

The great James Gordon Bennett International Cup Race, classic of the air, as it was, in former days, classic of automobile races, has been run, or flown, and won, for the third consecutive time, by a French defender. The average rate of speed of the winner, Sadi Lecointe, piloting a Nieuport plane, was a trifle under 200 miles per hour; not so great as had been anticipated, but the highest average speed that has ever been attained over the distance of 300 km.—186.3 miles. The official time of the winning machine was 1 hr. 16 min. 17⅕ sec. Much was expected of the American entries, as it was generally conceded by the critics that these planes showed speed possibilities in excess of their rivals, being better streamlined and higher-powered.

The nerve and skill of the American pilots could not be questioned. However, the race is not always to the swiftest. The final choice to represent America fell upon a Dayton-Wright machine piloted by Howard Rinehart, and the Verville-Packard, entered by the U. S. Army Air Service, flown by Capt. Rudolph Schroeder, holder of the world's altitude record. The famous "Texas Wildcat" and "Cactus Kitten," the two Curtiss-type machines, of which unheard-of speeds were expected, crashed during preliminary trials and were eliminated. The Italian and English contestants were also unfortunate, the former being unable to start and the latter to finish. Aside from the performance of the winner, the honors of France were upheld by Captain de Rominet, who finished second in an elapsed time of 1 hr. 39 min. 53⅗ sec., and Captain Kirsch, who made a most creditable showing with a distance of 200 km. to his credit when he was forced to withdraw. Although the planes exhibited marked refinements of the accepted methods of construction and of component parts, the U. S. Army entry was the only one in which an advance in aerial engineering was attempted. This is a method of simultaneously withdrawing the landing gear within the fuselage and decreasing the chord of the planes.

TO TRY ICE-DAM FORMATION TO HOLD STORAGE WATER

Because the water supply of the small city of Ashland, Ore., is becoming inadequate in the summer, and increasing the storage facilities would cost $100,000, the local engineers are trying an experiment as ingenious as it is simple. High up the side of Mt. Ashland, at the headwaters of the supply, a system of piping and sprays is being installed, through which the surplus water of winter will be directed and allowed to freeze. The damming action of the ice walls thus formed, and the gradual thawing of the ice itself, are expected to provide enough water for all the needs of summer.

IMPROVED DENTAL MOTOR IS USEFUL IN MANY WAYS

Because it may be hung on any hook or standard bracket, a new form of electric dental motor offers several advantages over the usual types. The motor itself, of 1/12 hp., is contained in a stout aluminum casing. The shaft, projecting at one end, is fitted for regular flexible-shaft connection, while the opposite end carries a swiveled suspension ring. In another form, the suspension member is a yoke pivoted in the sides of the casing, allowing the motor to be moved in any direction. With this arrangement, polishing or lathe work may be done with one end of the shaft, while the other end drives a dental drill. The flexible shaft may be replaced by a fan, if desired. A novel foot control starts, stops, reverses, and regulates the speed of the motor with one lever.

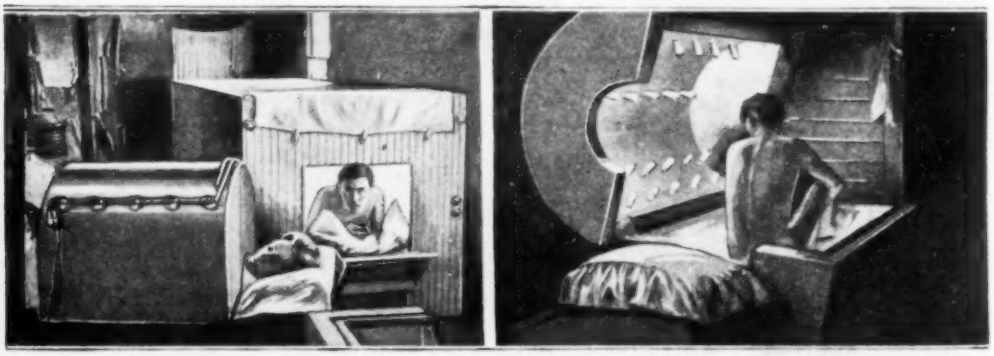
Left: The Dental Motor Hung by a Ring Opposite the End of Its Shaft. Right: Suspension by a Yoke Pivoted in the Side of the Casing

NEW TRIGGER FOR ARMY RIFLE REVERSES USUAL OPERATION

With all the improvements that the modern army rifle represents, no change has been made in the general form and operation of the trigger since firearms were first used. There is now under test in certain U. S. arsenals, however, a new type of trigger action that, while similar in appearance to the usual form, actually reverses the familiar firing operation. To fire, the new trigger, which has considerable fore-and-aft movement, is pulled clear back, and then allowed to move forward again. At about the halfway point of its forward travel the rifle is discharged. Because of this curious action, it is called a relaxing trigger, and its army-officer inventor asserts that better marksmanship results by avoiding the tenseness of the usual trigger pull, a claim borne out by the tests. A safety button on the grip behind the guard, where the second finger naturally finds it, locks the action against firing except when desired.

RADIANT THERAPY CABINET PRODUCES GOOD RESULTS

An Oregon physician has been making a very extensive application of radiant-energy therapy. Like many of his colleagues, he prefers not to commit himself as to just which component of the radiant energy brings about the beneficial



Left: A Small Light Cabinet and Also the Largest Size. Right: The Arrangement of the Light Bulbs in Such a Way That the Whole Body may be Exposed for General Treatment

Left: The Slit in the Boat Deck Made by the Broken Beam.
Center: The Part That Did the Mischief.
Right: The Break in the Beam

effects. That the effects are brought about is of sufficient interest to those suffering from ailments to which the treatment is applicable. The cabinet is a light-tight, though not necessarily air-tight, box, containing a number of the common variety of lighting bulbs. Suitable switches for controlling the volume of light and heat are mounted in a handy position. The treatment is considered especially effective for tuberculosis, rheumatism, stomach, and intestinal disturbances.

NEW ALL-METAL LAMP SHADE PREVENTS EYE STRAIN

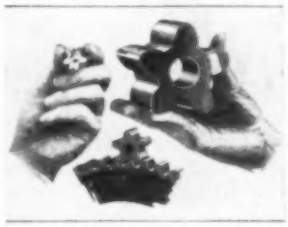
The manufacturers of a new all-metal lamp shade claim that, owing to its reflecting angles and the fact that no direct rays are projected, the light source being covered, it prevents eye strain and the loss of efficiency due to this cause. Although the light source is covered, it is said that the shade projects a concentrated ray of ample intensity and volume to allow close work to be performed.

WALKING BEAM BREAKS, WRECKING FERRYBOAT

Collapse of the walking beam recently caused the piston column of a sidewheel ferryboat that plies the waters of San Francisco Bay to slice through the roof and floor of the passenger saloon like a knife through so much cardboard. The cause of the failure, ascertained subsequently, was a defective weld in one of the 6 by 6-in. wrought-iron bars of the diamond frame. Destruction was not confined to the top of the vessel, however. Down in the engine room the steam cylinder cracked, big as it was with its 12-ft. stroke, its 4-ft. bore, and its weight of eight tons, as the piston, relieved of its load, plunged downward against the head. Altogether, the damage was estimated at $60,000, and will necessitate a stay of three months or more in the shipyard. No lives were lost as, fortunately, the passengers on board were few. Naturally, these were stricken with panic; but all were transferred without injury to passing vessels.

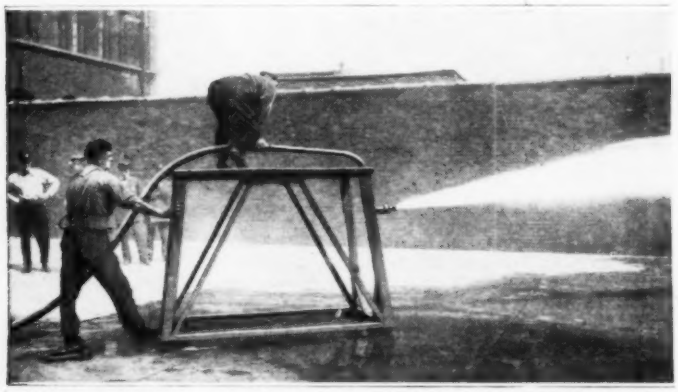
TEETH OF ODD CONTOUR IN NEW DESIGN PINION

Heretofore a limit of twelve teeth has been set as the minimum below which it was considered as impracticable to go in gear design. The arbitrary limit has been set aside by the designer of a new pinion. It is claimed that, owing to a peculiar tooth contour, pinions with as few as five teeth can be made that perform all the duties of the larger pinions as silently, efficiently, and reliably as the latter. In numbers of cases it is desirable to keep the distance from center to center of shafting as short as possible. Here is the field of the small diameter, coarse-pitch pinion.



ONE-MAN CONTROL HIGH-PRESSURE NOZZLE

A novel form of hose nozzle has been adopted by the Chicago fire department.



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A New Fire-Hose Nozzle, Adopted by the Chicago Fire Department: The Reactive Force of the Stream Holds the Nozzle in Position

It is designed to rest upon window ledges or other raised objects. On account of the reactive force of the stream and the peculiar angle at which the nozzle is bent, it is held firmly against whatever may be used as a support. As the manipulator is relieved of both the weight of the nozzle and the back pressure of the stream and has to exert no effort other than that required to swing the nozzle, either vertically or horizontally, one man is all that is required.

DIMINUTIVE TANK SHIP BUILT TO CARRY OIL IN ALASKA

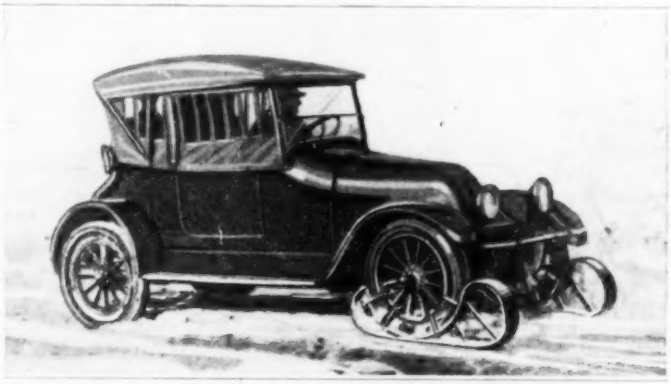
Though chiefly remarkable for its smallness, a tank ship recently launched at a west-coast yard, for service in Alaska, has a number of interesting features. The wooden hull is 65 ft. long, 15 ft. wide, and 6 ft. 4 in. deep. Its capacity is 12,000 gal. of oil, besides 1,500 gal. for its own boilers, and deck room for another 1,500 gal. in drums. Being equipped with twin engines of 120 hp., it will be able to tow additional loads on scows. The tiny tanker is of exceptionally stout construction, costing $35,000, and can be operated by two, or even one man, as the engine is controlled from the pilot house.

WESTERN LAKE SPRINGS A LEAK AFTER EARTH DISTURBANCE

After gaining a reputation among fishermen and camping parties by many years of reliable behavior, Pamelia Lake, in the mountains of western Oregon, suddenly sprung a leak last summer like a punctured basin. Toward the end of the season the water surface had shrunk to a few acres, all the rest having drained out through fissures in the bottom, enlarged, apparently, by some subterranean disturbance. Engineers of the Forest Service have lowered mattresses of fir boughs, weighted with stones, into the lake, in an effort to stop the leak, and save the fish from the extinction that threatens them.

SIMPLE EQUIPMENT FITS AUTO FOR USE IN WINTER SNOWS

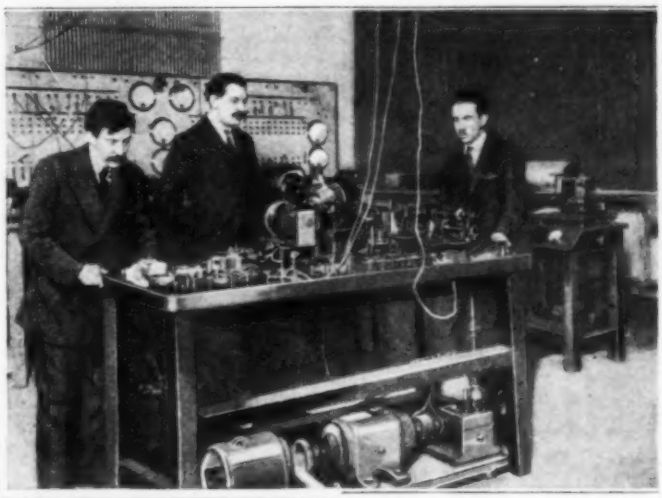
Throughout the winter, often despite snowdrifts eight and ten feet deep, two brothers living outside Bangor, Me., have motored daily to and from their office in the city. Their car's winter equipment is simple but quite efficient. Two toboggan-like runners are fastened with straps of metal to the front wheels. These runners are about eight inches wide and three feet long. The rear wheels are provided with lug rings which give good grip on the snow. With its side curtains up, and using an air-cooled engine, the car is practically immune to weather conditions.



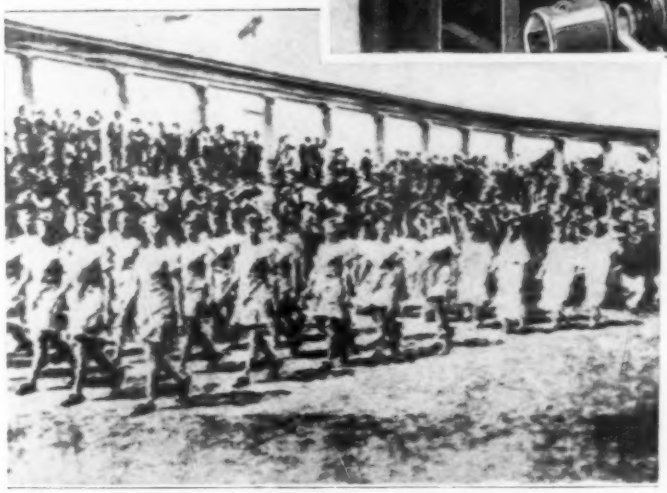
The Front Wheels are Fitted with Tobogganlike Runners, the Rear Wheels with Lug Rings, for Service through a Hard Maine Winter

PICTURE OF OLYMPIC GAMES SENT TO PARIS BY WIRE

Photographic telegraphy was put to interesting use a short time ago, when a picture of marching women, representing Sweden's athletic contingent, was transmitted over 200 miles of telephone wire from Antwerp to Paris. The method employed was a development of the Belin process, described in this magazine in June, 1910, and is remarkable for its use of the telephone principle. For transmitting, a carbon photographic print is used, mounted on a drum exactly similar to that of a cylinder phonograph. A metal point makes electrical contact with the traveling surface, and the passing current varies with the density of the carbon deposit of the picture. These variations are amplified by means of a microphone, and transmitted over the wire. The receiver, working on the principle of an oscillograph, reconverts the impulses into visual images.



The Oscillographic Receiving Apparatus, Which Converts the Transmitted Electrical Vibrations into Visual Images on Paper

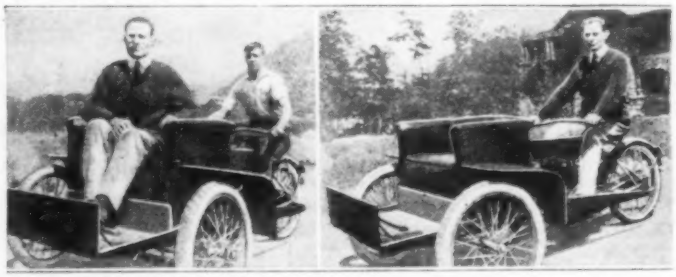


WIDE WORLD PHOTOS

Reproduction of the Photograph of Swedish Women Athletes Marching in the Olympic Games, as It was Reconstructed by the Receiver at Paris, after Passing over 200 Miles of Wire in the Form of Electric Waves

TRICAR CARRIES PASSENGERS IN FRONT

Riding ahead of the driver with nothing to obstruct the view is an experience enjoyed by the passengers in a tricar constructed from a standard motorcycle. There is ample seating space for two, and four have been carried in emergency. Inclement weather is provided for by a waterproof covering. The machine is used at an eastern summer hotel to carry passengers to and from trains. The upkeep is low, and the garage space needed very small. Steering is done with the front wheels.



An Exhilarating Experience is Enjoyed by Passengers Riding in This Tricar. There being Nothing to Obstruct Their View of the Roadway, an Exaggerated Impression of Speed Is the Result

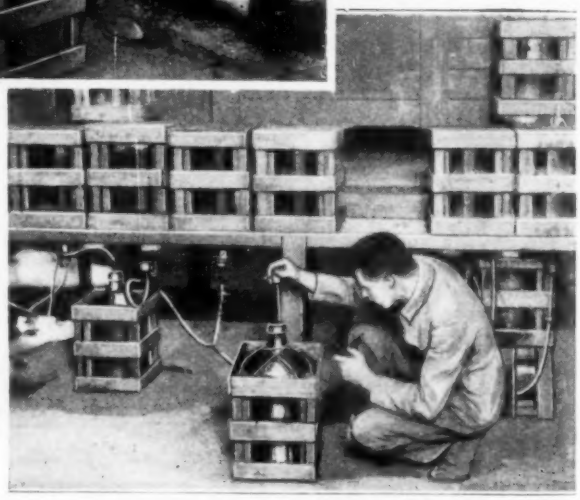
OYSTER HATCHERY USES CENTRIFUGAL FORCE

Above: The Inverted Glass Carboys with their Air-Feed Pipes, Used as Hatching Tanks for the Oysters. Right: The Centrifugal Separator by Means of Which the Young Oysters are Extracted from the Water for Changing and Feeding

Hatching oysters from the egg, as fish are propagated in a hatchery, presents difficulties that heretofore have been insurmountable. A newly hatched oyster is about .0025 in. long, and can be seen only with a microscope. For a month after hatching, they do not "set," or attach themselves to anything, and it has been impossible to change the water in the hatchery, for supplying food, without losing most of the collection. Now, however, a conservation official of New York State has devised a remarkably ingenious method of handling them, and continued tests prove it completely successful.

The secret of the system lies in the use of a modified cream separator, through which the minute crustaceans pass without harm, the centrifugal machine extracting them from the water as cream is taken from milk. They are then collected in a bowl, and transferred to a container of fresh water. Inverted 5-gal. glass carboys are used as the hatching ponds, a plug of porous wood and a long tube through the stopper allowing a circulation of compressed-air bubbles that both aerates and agitates the water. After the young oysters have "set," they are able to shift for themselves. A single female oyster produces from 10,000,000 to 100,000,000 eggs a season, yet the oyster crops of eastern waters are failing. It is evident, therefore, that the new process has a useful and valuable career ahead of it.

¶Mucilage in sheet form, for sticking two papers, or other things, together, is now put up in handy books. The books consist of thin sheets of paper with a film of dry mucilage on both sides.

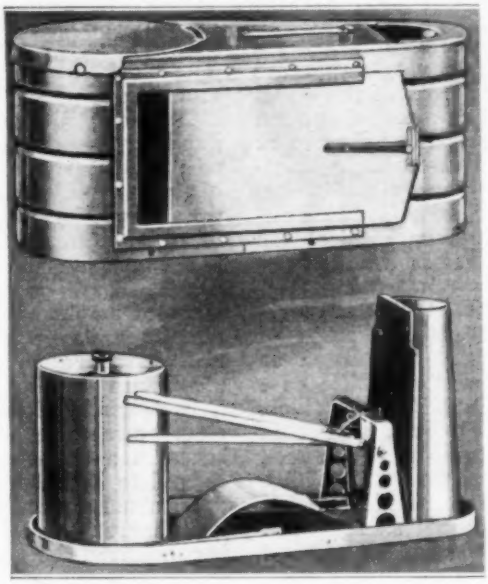


In Each Tank Stopper Is a Plug of Porous Wood, through Which Compressed Air is Forced, and a Long Air-Outlet Tube

LIGHTEST METEOROGRAPH FOR ROCKET EXPLORATION

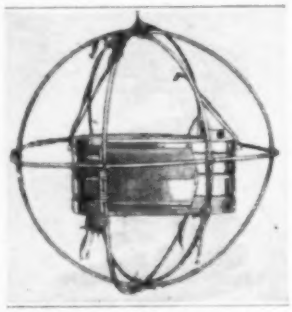
BY S. R. WINTERS

A NEW meteorograph for investigating atmospheric conditions at high altitudes has been designed by a member of the United States Weather Bureau as a possible companion instrument to the Goddard rocket exploring device described in the March, 1920, number of Popular Mechanics Magazine. Lightness is the meteorograph's outstanding superiority over similar devices for recording temperature, moisture, pressure, and wind velocity miles above the earth's surface.



The New Light Meteorograph with Its Cover Lifted to Reveal the Mechanism: The Clockwork-Driven Drum at the Left may be Lifted Out through the Top of the Cover, While the Marking Pointers, Pivoted and Actuated at the Right, Are Accessible through the Sliding Door in the Side

Heretofore the high cost of the rubber balloons employed in lifting the heavier type of weather-recording instrument obviously has restricted its use as an ally in weather prophecy. A meteorograph, designed by a Frenchman in 1904, weighs 938 grams (about 2 lb.), including the parachute and basket. The new American apparatus, which has met rigid laboratory requirements, but has not been tested in ascensions, weighs only 180 grams. Another French instrument, weighing only 48 grams, can be carried by a small pilot balloon, but as it is incapable of recording elapsed time and progressive changes in weather conditions, it cannot be compared with either the earlier French or the present American instrument.



The Meteorograph Alone Weighs Only About Six Ounces, and with Its Protecting Basket and a Parachute, Ready to be Carried Aloft, a Little More than Nine Ounces

The clock of the new meteorograph has been simplified in many respects, lightness and cheapness being the chief considerations. Clockworks attached to earlier meteorographs run from 30 to 40 hours with one winding, while the time drum rotates once every 60 minutes. Since an exploring expedition seldom consumes more than three hours, strips of the records are not infrequently blurred or deleted, owing to tracings of surface conditions after the instrument has reached the ground. To remedy this, the clock of the new instrument has its main spring on the center staff, or minute-hand arbor, to which the time drum is clamped. Here a small watch spring is of sufficient power, and the number of rotations of the drum (less than seven) can be restricted as desired by winding the spring the required number of turns.

The mechanism for recording temperature, composed of a strip of "thermostatic metal," is described as ultra-sensitive, the closely welded strips of invar and bronze being only .2 mm. (1 millimeter is approximately .04 in.) thick.

The main feature of the barographic part of the instrument is its variable scale, whereby minor changes of pressure at altitudes above 10,000 meters (32,800 ft.) can be read with greater accuracy than is possible with a uniform scale. The ratio of the scale of a barograph to that of the mercurial barometer is 1 to 10; that is, 1 mm. of movement of the pen of a barograph at sea level is equal to a pressure change represented by 10 mm. of mercury. But the record sheets of the barograph cannot be relied upon within .1 mm. of space traversed, and thus, in the reading of altitudes exceeding 30,000 meters, an error in excess of 2,000 meters may occur. The variable scale of the new instrument, so it is claimed, does away with this source of error.

The humidity-recording device consists of six or eight strands, each composed of three fine hairs, and well protected

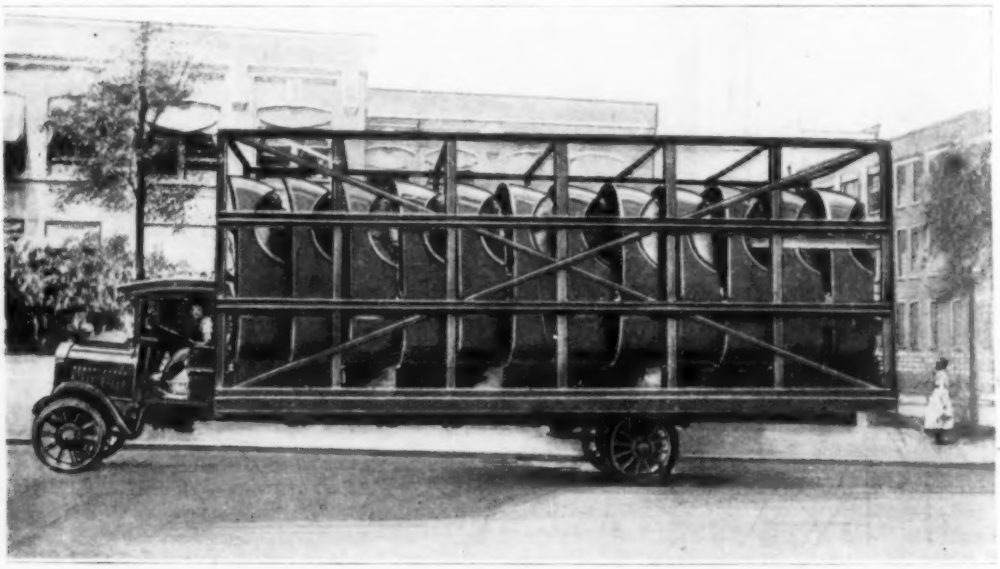
from the heat of the sun. Their torsion under the influence of varying conditions of humidity is communicated to a flat spring, the outer end of which is connected to the recording style. This unit is also said to be extremely sensitive to slight changes.

Another deviation from ordinary instruments is the use of a single time arc for all markers. The pivots of the styles are supported by a one-piece aluminum casting, and all three of the axes are at the same height. Shock-resisting qualities being essential, if such an instrument is to be installed on a Goddard exploring rocket, it has been so designed as to reduce disturbances in the mechanical arrangements to a minimum.

To this end, strains in the supports for the edges and cylindrical parts of both the case and base have been as far as possible counteracted. The case is of hard sheet aluminum, .2 mm. thick, and the cover is secured by a lock seam instead of rivets. The sides are braced by two or more deep "beads," or ribs. The bottom edge is double, and is fastened to the base by machine screws. A sliding door affords access to the mechanical parts, the clock drum being removed through an opening in the top of the case.

The parachute, weighing 50 grams, has only one-third of the surface of the lightest one in use. It can even be dispensed with, two pieces of dazzling-colored silk being attached to the apparatus to retard the descent and attract the attention of a finder. The outside dimensions of the new meteorograph are: length, 210 mm.; height, 90 mm., and greatest width, 85 mm. The clock drum is 80 mm. long and 55 mm. in diameter.

The possibility of making this or a similar instrument, more particularly adapted to the purpose, an adjunct to a Goddard exploring rocket, has added another to the suggestions offered by the U. S. Weather Bureau of means for obtaining the successive heights reached by the rocket. These are: trigonometric observations of smoke clouds, produced at definite intervals by smoke-producing materials placed among the charges of explosive, in the daytime, and, at night, of light flares by similar charges of magnesium powder; measurement of the pressures in a series of vacuum vessels arranged to be opened and resealed at predetermined points, and the use of recording apparatus. The first-named method is considered the most accurate, while the third is recommended by its simplicity, and the interesting possibilities of developing such an apparatus.



TRUCKS WITH 32-FOOT WHEELBASE CARRY AUTOMOBILE BODIES

TO the automobile trucks operated now for several months by a company producing daily about 750 pleasure cars, traffic in one busy industrial city of eastern Michigan always yields the right of way; and with good reason. These trucks are used for the transportation of bodies from the body department to the assembly room. To fit them for this work, the wheelbase of each was lengthened to 384 in., and upon the spliced frame was placed a platform body of still greater length. This platform holds 24 of the pleasure-car bodies, in two rows of 12 each.

Left: The Observatory, Established for the Sole Purpose of Viewing Mount Whitney. Center: The Summit of the Mountain as It Appears through the Telescope, with the American Flag Wired to Its Rocks. Right: A Close-Up View of the Observatory and Its Telescope, Trained on the Peak 15 Miles Away

TELESCOPE SAVES TOURISTS MT. WHITNEY CLIMB

Mount Whitney, in Tulare County, Calif. (elevation 14,501 ft.), is the highest point of land within the continental limits of the United States. All travelers are interested in seeing it, but the trip to the summit is irksome, tedious, and dangerous, and consequently the number who have stood upon its icy summit are comparatively few.

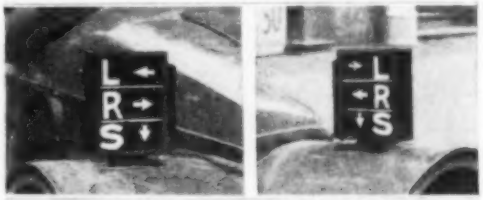
The town of Lone Pine, in Inyo County, stands near the foot of Mount Whitney, and is a port of call for innumerable travelers journeying north and south through the Owens Valley. It is nearer the summit of Mount Whitney than any other community, and most travelers are content to get no closer to the top of the United States.

Realizing, however, that they would enjoy a close-up view of the nation's summit without the necessity of climbing, a baker in the town set up a small observatory in connection with his establishment, where tourists, for 25 cents, may view the mountain top. A 200-power astronomical telescope brings the peak apparently to within a few feet of the visitor's eye, although it is actually 15 miles, by air line, from Lone Pine.

The observatory and telescope represent an investment of about $2,000, but the owner is doing a flourishing business, for his visitors often number as many as 100 per day. For the amusement of his patrons he recently painted an American flag on a piece of heavy sheet iron, lugged it to the top of the mountain, and wired it to the monument of rocks on the summit. The flag is distinctly visible through the telescope.

AUTO SIGNAL SHOWS WARNING AT FRONT AND REAR

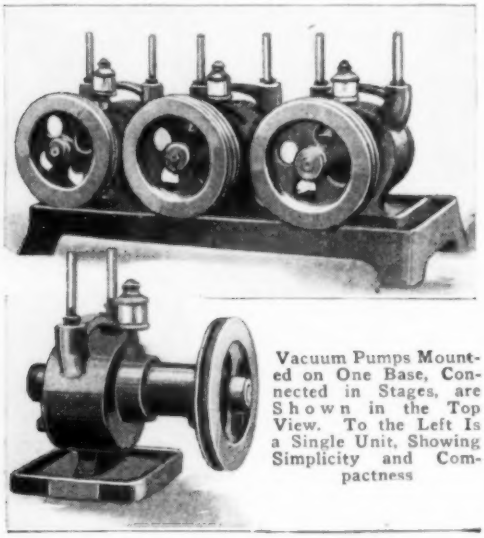
A double safety signal for automobiles, which indicates to pedestrians in front and the driver of a car in the rear, just what the driver of a car equipped with the new device intends to do, is a recent development. The device consists of a box mounted on top of the left rear fender, where it can be seen from both front and rear. It is divided into three compartments, in each of which a small electric lamp is mounted; these are placed directly behind the glass fronts, which are painted with arrows to show the direction the car is to take. The operation of the signal is controlled by a small switch on the steering-wheel post.



A Hand-Controlled Switch on the Steering-Wheel Post Operates This Automobile Signal, Which Shows an Illuminated Warning to Pedestrians in Front and to Cars Behind

INTERNALLY OIL-SEALED SUPER-VACUUM PUMP

A new rotary, high-vacuum pump for exhausting electric-light bulbs, mercury rectifiers, and experimental instruments,

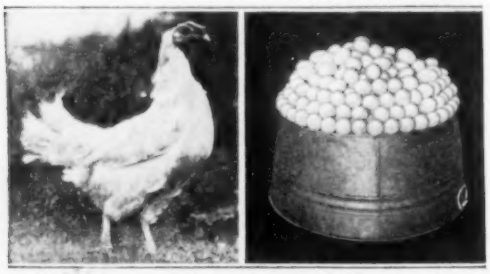


Vacuum Pumps Mounted on One Base, Connected in Stages, are Shown in the Top View. To the Left Is a Single Unit, Showing Simplicity and Compactness

has no need of being immersed in oil to prevent leakage, as has been the practice heretofore. The claim made for the new unit is, that, on account of an improved method of lubrication, an effective, internal oil seal is formed, which eliminates the necessity of the oil bath.

CHAMPION EGG PRODUCER OF THE UNITED STATES

"Babe Ruth," a 3½-lb. white-leghorn hen, has broken another record by laying 326 eggs during one season. The former official United States record was 314. The market value of "Babe Ruth's" record-breaking production is, approximately, $16. As her feed cost was $4, she must be credited with a profit of $12, a high return on the investment. She is the pride of a poultry specialist of Washington State, who is famous as a breeder of phenomenal layers. Several hens of the same flock have records of from 280 to 318 eggs per season.



Champion of the World Is the Title Earned by This 3½-Pound White-Leghorn Hen. The Tub Contains 326 Eggs, One Year's Production

VISIBLE GASOLINE FILTER INSURES CLEAN FUEL

A two-compartment, glass-chambered filter, in which a chamois-skin strainer removes dirt and water from the gasoline, has been devised to be applied to the dashboard or cowl of automobiles and motor trucks. Gasoline, direct from the tank, flows through the left-hand compartment of the device, where it is filtered through chamois skin, into the right-hand compartment, which serves the double purpose of showing the difference between the unfiltered and the filtered fuel, and whether the flow has stopped. When the device is used in connection with the vacuum system, this latter point is of value, as the vacuum tank usually contains enough fuel to drive the car

Top: The Ornamental Effect of the Highly Nickeled Gasoline Filter Mounted on the Dashboard. Right: The Near Chamber Is the Filter; the Second, the Observation Reservoir

quite a distance after the main tank is emptied. Fuel economy and avoidance of many carburetor troubles are claimed for the device.

PEARY'S NORTH-POLE FLAG IS FOUND TRAVELING SOUTH

Still floating serenely above the ice field in which it was planted, but 400 miles away from its original location, the American flag, erected by Commodore Peary at the North Pole in 1909, has been found by another explorer. Captain Hansen of the Amundsen auxiliary expedition reported the discovery of the Peary flag on his recent return, after 16 months spent in establishing food stations in the arctic ice for the benefit of the main expedition.

Mississippi River Seeks New Outlet

By H. H. DUNN

Captain L. V. Cooley, of New Orleans, with His Brother First to Call Attention to the Change in the Course of the Mississippi

Captain G. B. Cooley: The Cooley Brothers have Operated Steamships on the Mississippi for More than 40 Years

DRAWING THE TEETH OF THE FATHER OF WATERS

TO PREVENT THE MISSISSIPPI RIVER from leaving New Orleans high and dry on a long, deep, and narrow lake, two plans have been proposed:

The first is to beat the Mississippi River to it by cutting a canal near the point where the Red River empties into the Mississippi, from the last-named river westward some 10 or 15 miles to the Atchafalaya River, and allowing the greater part of the waters of the Mississippi to flow to the sea through this canal, regulating the amount which goes past New Orleans.

The objection to this is the fear that the reduced water flowing past New Orleans eventually would fill the old channel, and cut New Orleans off from the sea.

The second proposal is to separate the Red and Atchafalaya rivers entirely from the Mississippi, raise the levees all along the Mississippi southward to the Gulf of Mexico, and compel the Father of Waters to flow in his own channel.

The objection to this is that the level of high water will be increased by about three feet, all the way down the present channel of the Mississippi, and that the danger from higher levees is great, while the cost of such increase in levee height, for some 300 miles on either side of the stream, will lay a heavy debt on the state.

One conference has been held on the subject, at Jonesville, La., at which $10,000 was raised to defray costs of a preliminary survey of plans to divorce the rivers, in accordance with the second plan. Another conference has been called for November 15-16, at New Orleans, by Gov. John M. Parker.

THE Mississippi River is seeking a new channel to the sea, nearly 100 miles west of its present course. Apparently tired of being confined between high walls of earth, made to run deep, and work hard through the semitropic miles from Cairo to the Gulf, the Father of Waters is slowly but surely cutting his way through the Red and the Atchafalaya rivers down to the Gulf of Mexico, and, to help himself in finding this new channel, he is just as slowly and surely filling his present channel with a river-made dam of silt, a bit below the mouth of the Red River.

From a stream barely 15 ft. wide in 1840, the Atchafalaya has gorged on the waters of the Mississippi until it is now nearly 1,700 ft. wide, 40 ft. deep, and possessed of a current some 15 per cent faster than that of the Mississippi River at the same distance from the Gulf.

The Municipal Grain Elevators of New Orleans, Built at a Cost of $15,000,000 for the Express Purpose of Handling River-Boat Cargoes of Grain, but Now Threatened with the Possibility of being Left High and Dry by the Changing Course of the Mississippi River

According to measurements of competent engineers, more than one-sixth of the flood waters of the Mississippi went out this year by way of the Red into the Atchafalaya River and thence to the sea. Both the Red and the Atchafalaya are nearly three times their size of 10 years ago, according to records kept by Capt. L. V. Cooley, who, with his brother, Capt. G. B. Cooley, of Monroe, La., has been operating steamboats and barges on the river for 40 years, and has kept accurate records of the rise and fall of the stream every year of that time. In fact, it was Capt. L. V. Cooley who first called the attention of the Mississippi River Commission, the Board of Commissioners of the Port of New Orleans, and the various Federal and state engineers along the river, to the speed with which the Mississippi is trying to change its course this year.

A chart, compiled by several engineers familiar with the river and its vagaries, shows that the Mississippi this year lost 68,000 sq. ft. in low-water area, and 38,000 sq. ft. in high-water area, while the whole area—all figures for cross sections, of course—of the Red River, in 1911, nine years ago, did not exceed 27,000 sq. ft., or approximately the present low-water, cross-section area of the Mississippi River. They also found that the cross-section area of the Mississippi below the outlet into the Red and Atchafalaya rivers has been reduced nearly two-thirds in nine years, or from 95,594 sq. ft. in 1911 to 27,955 sq. ft. this season.

To understand this situation one must appreciate that the Mississippi has built for itself a flat, alluvial plain, most of which is little more than a foot above sea level, extending from Pearl River, on the east, to an irregular north and south line some 125 to 150 miles west of New Orleans, and north to the bluffs which mark the shore line of the prehistoric sea, near Baton Rouge, approximately 80 miles north of New Orleans. At the point where the Mississippi empties into the Gulf of Mexico, this delta projects, like a wrist and three-fingered hand, into salt water for a distance of 30 or 40 miles from the mainland. This bit of semisolid marsh, which is being slowly built up into delta land, is about 10 miles wide.

Through the delta, which has been solidified into the mainland of lower Louisiana, flow many rivers, bayous, and small streams, all running southward from sources in the central or northern part of the state. One of these is the Atchafalaya, which, rising slightly north of the point at which the Red River makes its mouth into the Mississippi, flows almost parallel with the Father of Waters, southward through several bayous almost wide enough to be called lakes, and thence to the Gulf through Atchafalaya Bay. This stream has a fall of .2 ft. to the mile, against .1

WHAT THE MISSISSIPPI RIVER WILL TAKE FROM NEW ORLEANS SHOULD IT WIN NEW WAY TO SEA

IF THE MISSISSIPPI RIVER succeeds in making a new course for itself to the sea, as it is now attempting to do, it will make Morgan City, La., 100 miles to the west of New Orleans, the main port of the Mississippi Valley, and, according to river captains and engineers, put New Orleans on a currentless inland lake, 110 miles from the Gulf.

Among the public utilities and private industries which would be rendered useless at New Orleans by the change in the river are:

The $20,000,000 army-supply base recently completed.

The $20,000,000 inner harbor and navigation canal, now nearing completion, intended to connect the Mississippi River with Lake Pontchartrain and furnish a short cut to the Gulf of Mexico.

The $15,000,000 municipally owned and operated grain elevators.

The $10,000,000 municipally owned cotton compress and warehouse.

The American Sugar Refining Company's plant, the largest sugar refinery in the world.

The Algiers Naval Station, just across the river from New Orleans, in which at least $7,500,000 has been invested.

The Jahncke Shipbuilding and Repair plant, with an investment of some $7,000,000.

The Doullut & Williams and the Foundation Company shipyards on the inner harbor, representing investments of $5,000,000 each.

The jetties at the mouth of the river, in construction of which the Federal government has just completed an investment of $12,000,000.

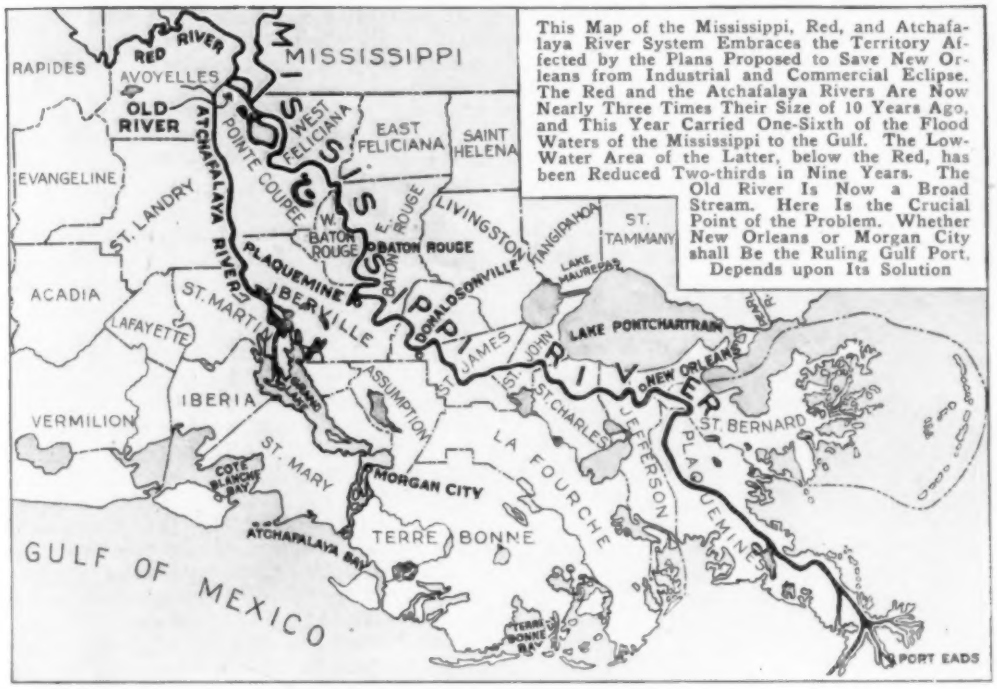
The government-owned and operated Mississippi River barge line.

Some 30 steamboats and steam packets, now plying in and out of New Orleans over the Mississippi River and tributary streams, all representing an investment of close to $1,000,000.

The municipally owned and operated Public Belt Railroad, which connects every wharf and landing place on the harbor with the railroad trunk lines entering New Orleans.

Four miles, or thereabout, of steel sheds, owned by the city and state, covering the wharves on the river front, and all the equipment for loading and unloading deep-sea ships.

Finally, such a change in the course of the river would put New Orleans completely at the mercy of the railroads, so far as all inland commerce would be concerned, inasmuch as river traffic to the north would be cut off, and transferred to Morgan City and the new river, now known as the Atchafalaya.



This Map of the Mississippi, Red, and Atchafalaya River System Embraces the Territory Affected by the Plans Proposed to Save New Orleans from Industrial and Commercial Eclipse. The Red and the Atchafalaya Rivers Are Now Nearly Three Times Their Size of 10 Years Ago, and This Year Carried One-Sixth of the Flood Waters of the Mississippi to the Gulf. The Low-Water Area of the Latter, below the Red, has been Reduced Two-thirds in Nine Years. The Old River Is Now a Broad Stream. Here Is the Crucial Point of the Problem. Whether New Orleans or Morgan City shall Be the Ruling Gulf Port, Depends upon Its Solution

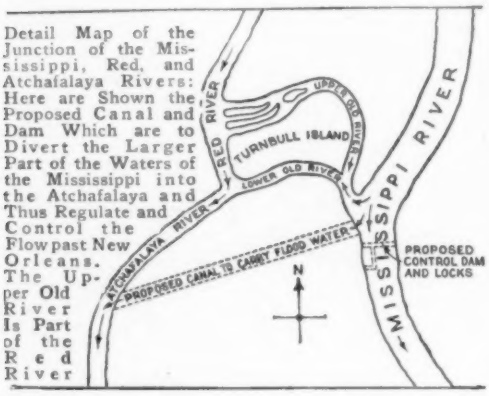
ft. in the Mississippi River. The distance from the mouth of the Red River (the bayou called "Old River") to the Gulf by the Mississippi is 300 miles; from the same point, by the Atchafalaya, it is about 100 miles. Thus the reason for the vast volume of waters of the Mississippi seeking a shorter cut to the Gulf is plain, especially when it is remembered that the Mississippi, during the season of flood, is nearly twice its normal, or mean-water, size.

But the most serious part of the whole matter is the fact that the Father of Waters, moving his channel 100 miles westward, calmly ignores a city of nearly 400,000 inhabitants, the main port of the Mississippi Valley, which sits on his banks, 110 miles from the Gulf of Mexico. There is, it is true, another city on the Atchafalaya, just where the new course the Mississippi is seeking runs into Atchafalaya Bay, but the city of New Orleans has no intention of yielding to Morgan City, and allowing the commerce of the Mississippi Valley to flow down a new channel, past a new port, making useless more than $150,000,000 worth of public utilities, port improvements, harbor facilities, and private industries, just because a little thing like a river, half a mile wide and 100 ft. deep, has decided to change its channel for a shorter one.

Immediately following the call of the Captains Cooley and other river steamboat owners and operators, as well as of river engineers for both state and Federal governments, the people of eight Louisiana parishes — Catahoula, Franklin, Concordia, Tensas, LaSalle, Rapides, Ouachita, and Avoyelles—met at Jonesville, and formed the Louisiana Flood Control Association, electing Judge John Dale of Vidalia president, and subscribing $10,000 for preliminary surveys and drawing up of plans to separate permanently the Red and Atchafalaya rivers from the Mississippi. They also agreed to subscribe further funds to the work when the Federal government had been interested. Aside from keeping the Mississippi in its regular channel, and saving New Orleans as the principal port of the Mississippi Valley, all the people of these parishes seek to reclaim nearly 3,000 square miles of land which is inundated at flood season every year by the waters of the Mississippi that the Red and Old rivers are unable to carry into the Atchafalaya.

Following this meeting, an appeal for aid was taken to Governor John M. Parker, who, appreciating the grave danger to New Orleans, called a conference of the Mississippi River Commission, the several levee boards, the Board of Port Commissioners of New Orleans, the

Louisiana Flood Control Association, Federal and state engineers, and all others interested, at New Orleans, November 15th and 16th. Joseph E. Ransdell, senior senator from Louisiana; Senators J. Y. Sanders and Edwin S. Broussard, and Representative Riley J. Wilson, immediately took hold of the project and have carried to Washington an appeal for Federal aid as the only way to save the lower Mississippi from becoming a land-locked lake, and to reclaim the flooded lands already mentioned.



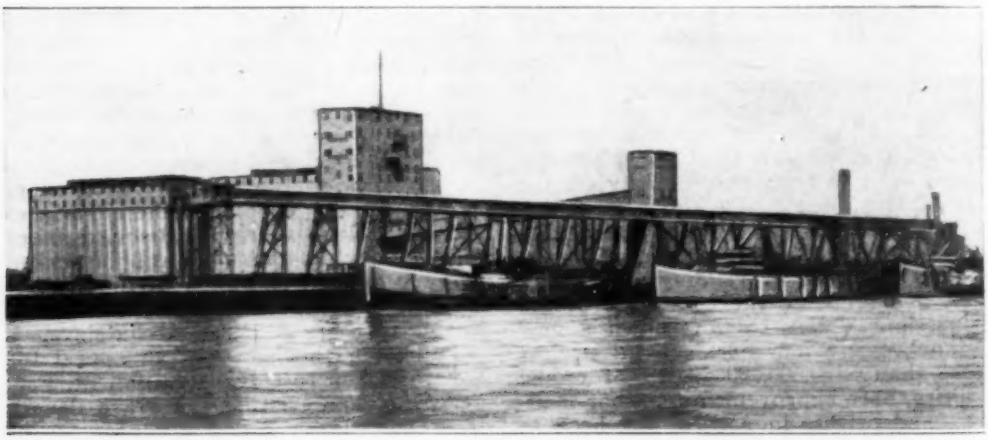
Detail Map of the Junction of the Mississippi, Red, and Atchafalaya Rivers: Here are Shown the Proposed Canal and Dam Which are to Divert the Larger Part of the Waters of the Mississippi into the Atchafalaya and Thus Regulate and Control the Flow past New Orleans. The Upper Old River Is Part of the Red River

Capt. L. V. Cooley, dean of the river-steamboat owners and operators on the lower river, in his warning of the danger to New Orleans, said:

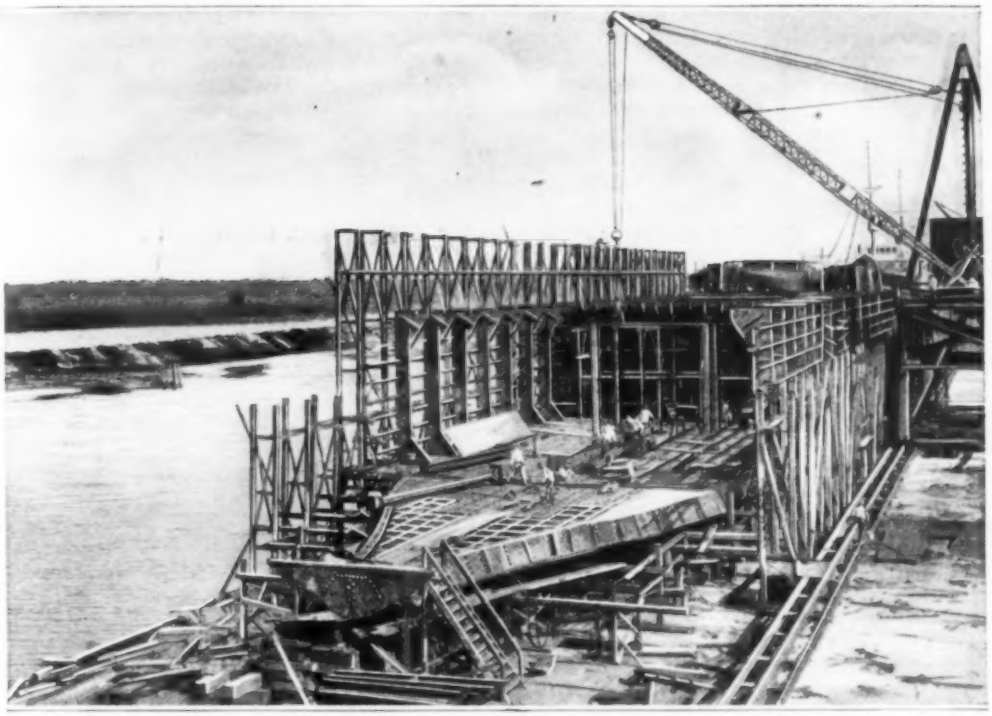
"New Orleans will be an inland city inside of 25 years, and the Mississippi River will be flowing into the Gulf of Mexico 100 miles west of the present mouth, leaving New Orleans on a shallow lake, and making the 300-mile channel from the mouth of the Red River, to the $12,000,000 jetties useless, if the silting of the main channel below the mouth of the Red River is allowed to continue at the rate it has been filling in for the past 10 years. Approximately 2,000 square miles of arable land was flooded and under water for more than 40 days this season. All the cotton crop in that flooded section has been destroyed, entailing a loss of millions of dollars, besides making many farmers homeless and penniless.

"All this has been done without the breaking of a single levee along the Mississippi River, solely by the flood waters of that river escaping through the Red River and seeking a new outlet through the Atchafalaya into Atchafalaya Bay, just east of Cote Blanche Bay, and thence to the Gulf of Mexico. This year, by careful measurement of the engineers, more than one-sixth of the flood waters of the Mississippi went out this way. This has been a source of misplaced rejoicing to New Orleans, because, through this seeming relief, no damage has been done to levees or to property on the lower river by flood waters, but it emphasizes the much more serious problem of a change of 100 miles in the course of the Mississippi River, leaving a city of 400,000 inhabitants high and dry on a shallow lake, once the bed of the lower Mississippi."

The responsibility for the driving of the waters of the Mississippi out through the Old River into the Atchafalaya seems to lie with the Father of Waters himself, through the silting up of the channel, and thereby the formation of a natural dam



The Government's $20,000,000 Army-Supply Base, Recently Completed at New Orleans, will Share the Fate of the Grain Elevators, and be Left 100 Miles Away from the Waterway on Which It was Built, If the River Is Able to Carry Out Its Present Threat of Removing Its Channel from the City



Building a 10,000-Ton Steel Vessel at a Busy Shipyard on the Inner Harbor and Navigation Canal, Connecting the Mississippi River and Lake Pontchartrain at New Orleans: Should the River Succeed in Making Its New Outlet, This New $20,000,000 Waterway will Be Useless

just below the mouth of the Red River. Capt. L. V. Cooley gives a lucid explanation of this in the following words:

"There is also an appreciable loss in the force of the current in the Mississippi River below the mouth of the Red. I have just returned from a trip in my steamboat into these waters, and the current below the outlet, I estimate, is about one-half the strength it was 10 years ago. I have been operating steamboats through this current every month of the year for the past 40 to 45 years. At low water, within the past five years, a dry sand bar has appeared in the middle of the Mississippi about a mile below the mouth of this Red River outlet. This year, in high water, the deepest channel we could find across this bar was 9 ft.; in the same month, in 1911, nine years ago, there were 55 ft. of water in the same place. This shows clearly the filling up of the channel at the rate of about 5 ft. a year. This is the shallowest spot in the channel south of Vicksburg, and this year it was barely deep enough to let through my steamer 'America,' and our tows of barges.

"All these factors lead me to the conclusion—and I may say that every other river captain and engineer with whom I have talked is of the same opinion—that if the Mississippi River is allowed to continue to silt up below the mouth of the Red River, as it has in the past, and the mouth of the Red River is allowed to continue cutting through to the Atchafalaya, New Orleans' future will be that of a 'port' without water connection with the other towns of the Mississippi Valley and without deep-water connection with the Gulf of Mexico. The Mississippi below the mouth of the Red River will become just a large, shallow lake, and a new city will rise on the banks of the Atchafalaya, 100 miles west of the present city of New Orleans. That is to say, the mouth of the Mississippi will be at Morgan City instead of at Port Eads, as at present.

"The remedy, in my opinion, is to close the mouth of the Red River, compelling it to flow to the sea down the course of the Atchafalaya, and completely separate both the Red and the Atchafalaya from the Mississippi River. To do this, however, it must be understood that the Red and Atchafalaya rivers and the Bayou Terrebonne were once mouths of the Mississippi, and that the closing of these streams will force a tremendously greater

volume of water than now down through the levees of the main channel of the Mississippi past New Orleans to the Gulf of Mexico. If these streams are divorced from the Mississippi, commerce into them still can be served from the Mississippi to the Red, Ouachita, and Atchafalaya rivers and the Bayou Terrebonne, through the Plaquemine locks at Donaldsonville."

This remedy is also supported by Senators Ransdell, Sanders, and Broussard, and Representative Wilson, as well as by the Louisiana Flood Control Association, but there is another considerable faction which maintains that it is impracticable, because of the tremendous strain which would be put on the levees all the way from the mouth of the Red River to the Gulf, and because this added water would increase the flood-water level by about three feet at New Orleans. The surface of the Mississippi River at flood height is now several feet above the main business streets of New Orleans, and there is a variation of some 21 to 22 ft. between mean low water and flood height.

Thus, the opponents of the plan to divorce the Red and Atchafalaya from the Mississippi, who are led by John Klorer, a member of the Louisiana State Board of Engineers, claim the danger to New Orleans would be greater if the entire stream of the Mississippi were confined to its levee-walled present channel than if part of those waters were allowed to seek the sea by way of the Red and Atchafalaya rivers. They, therefore, would seem to advocate that control be placed on the main river, so that only a certain part of its waters could flow through the new channel, maintaining enough through the present channel to provide for the commerce of the port of New Orleans, without putting undue strain on the levees, or endangering the city.

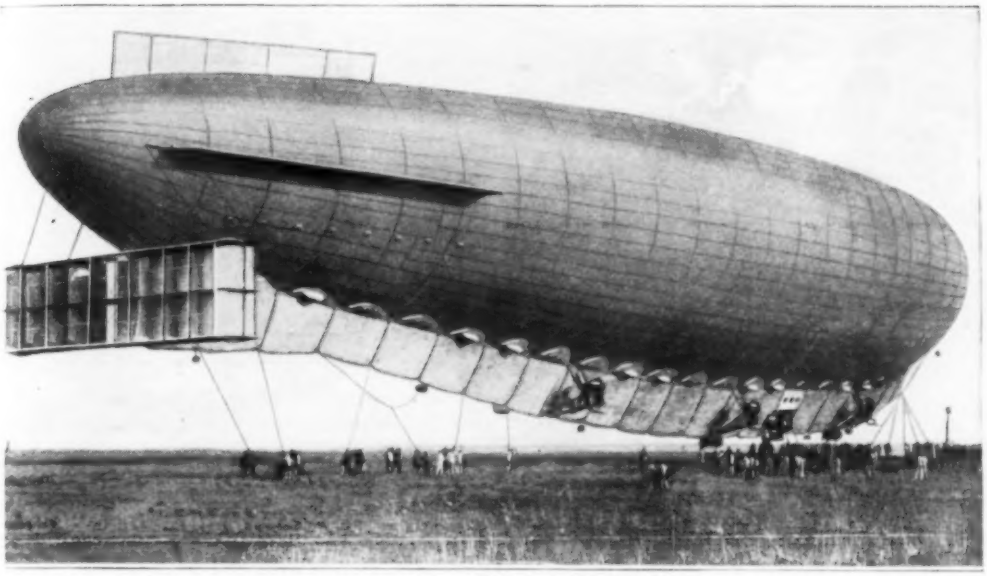
This plan, however, takes no cognizance of the flooding of between 2,000 and 3,000 square miles of arable, cultivated land, in eight parishes, with consequent loss of millions in potential or actual production every year through the havoc wrought by these flood waters of the Mississippi being allowed to go out through the Red and the Atchafalaya.

The project to divorce the Red and the Atchafalaya from the Mississippi, without doubt would save all this land, and the crops and the farmers thereon, but it would endanger as much more land below the mouth of the Red River, as well as the city of New Orleans.

Some years ago, M. F. Jefferdo, a civil engineer devoted to public works, presented a plan, through Popular Mechanics, whereby a canal would be constructed connecting the Mississippi and the Atchafalaya, through which the flow of the flood waters of the Mississippi could be controlled. This plan would save both the farming lands and the city of New Orleans, would increase the commerce on the Atchafalaya, down past Morgan City, which probably would become a port comparable with Mobile, and still would leave the main channel flowing clear past New Orleans and out through the jetties to the sea. This plan will be one of those considered at the conference.

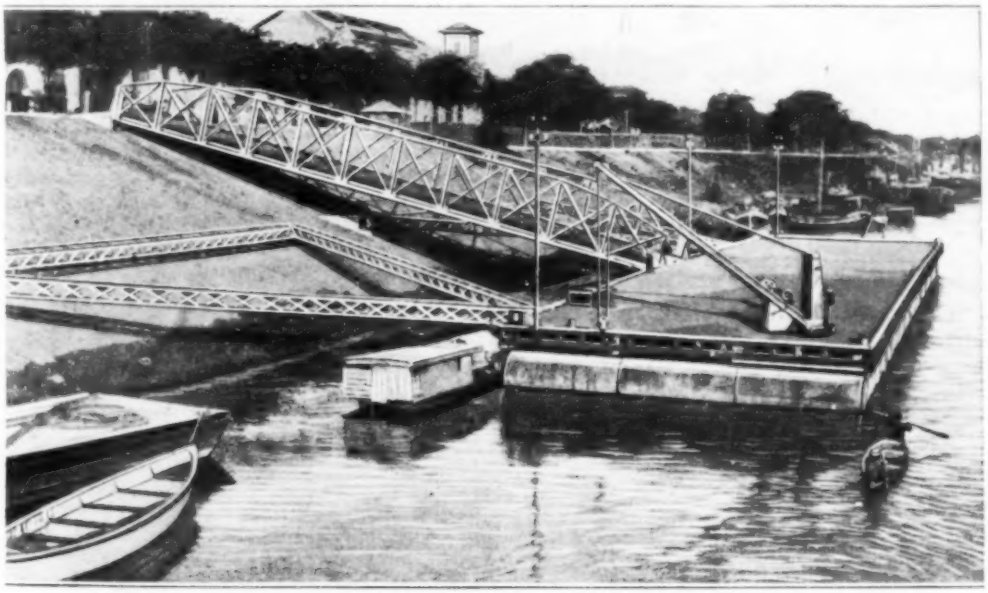
Still another plan, on which government engineers under Major Dent have been making surveys, is to find an auxiliary channel from New Orleans to the Gulf to help the main channel of the Mississippi to carry off these flood waters. The state of Louisiana and the city of New Orleans are now completing a canal, known as the Inner Harbor and Navigation Canal, some six miles long, connecting the Mississippi River, through locks, with Lake Pontchartrain, and running across the lower business section of the city. This canal, which was to have cost $4,000,000, has so far cost approximately $20,000,000, but connects only with a shallow lake, whose greatest depth is 17 ft. in spots, and whose average depth is 9 ft. It is obviously impossible to dump the tremendous volume of the flood waters of the Mississippi through this canal into a shallow lake whose waters already are virtually at the land level of New Orleans. A steamer of 9,600 tons, and drawing about 12 ft. of water, recently required five days to make its way, assisted by two tugs, across this lake, from the lake end of the new canal to the Gulf of Mexico. Consequently, there seems to be some question as to the eventual utility of the $20,000,000 investment.

Several engineers, who are investigating the Mississippi's attempt to change its course, are of the opinion that one solution would be to straighten the course of the Mississippi from New Orleans to the sea, while still another idea, which has been broached, is to cut a canal from a point opposite New Orleans through the Arabi swamps, straight to the Gulf of Mexico. All these projects doubtless will come up for consideration at the approaching meeting, all those interested being determined that something must be done to prevent the old Father of Waters from throwing New Orleans high and dry on the bank of an inland lake.



ITALIAN DIRIGIBLE REPORTED PURCHASED BY THE UNITED STATES

THE "Roma," reported as having been purchased by the United States government, is an excellent example of Italian aeronautical engineering. It is of the semirigid type, powered by six independent engines of 400 hp. each, has a gross lifting capacity of 37 tons, and is capable of speeds of from 68 to 74 miles per hour. As the keel framework is completely inclosed, to diminish head resistance, the motors are mounted on framework structures outside the covering. A cruising speed of 56 miles per hour can be maintained with one pair of engines. The illustration shows the great ship starting upon a trial spin. It is expected that the "Roma" will be delivered under its own power.

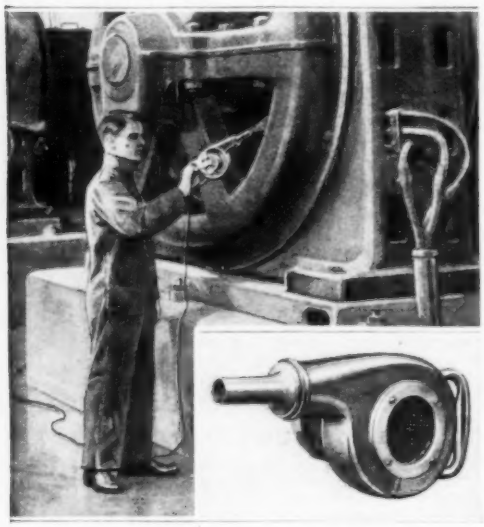


FLOATING DOCKS OVERCOME FLOODS OF ORIENTAL RIVER

DURING the seasonal floods of the Mekong River at Pnompenh, Cambodia, a French dependency, the waters rise from 45 to 50 ft. Under such conditions ordinary wharf and dock construction is useless. French engineers have, however, built floating wharfs that permit vessels to land cargo and passengers regardless of the river's depth. These floating wharves are built on caissons and are connected to the shore by steel bridges, which are hinged at both shore and wharf ends, so that the caissons are free to rise and fall with the water.

LITTLE BLOWER WORKS WHERE VACUUM CLEANER CANNOT

Exactly opposite in principle to the vacuum cleaner, a new portable electric blower successfully removes dust where

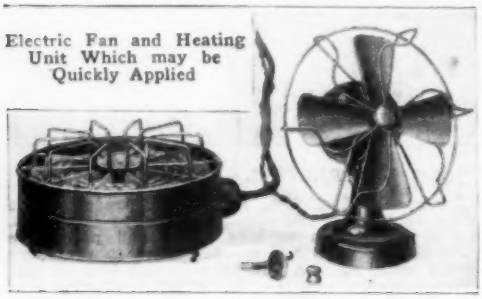


The Portable Blower Removes Dust from the Crevices of Machinery and Other Places Inaccessible to a Vacuum Cleaner

suction cannot operate, as in the crevices of complicated machinery, on shelves, in stock bins, and around pianos. The machine, entirely self-contained, weighs but 6 lb. with a ⅙-hp. motor, and is held like a pistol by the handle on the back. The intake opening on the side is screened, and may be fitted for a 2-in. pipe if desired, for fixed operation.

VARIED-PURPOSE ELECTRIC FAN HAS HEATING UNIT

Few persons ever think of an electric fan in terms of heat. Nevertheless a fan, used to distribute heat, is a part of a combination appliance recently placed on the market. A round framework, slightly larger in diameter than the fan guard, has a heating element within it arranged in such a way that, when fitted to the fan, the air is heated and may be blown wherever desired. It is claimed that a room may be quickly and uniformly heated by the device. As a quick drier of hair and small cloth articles it is said to be excellent. Being so arranged that the fan and heater are on different circuits, either unit may be used independently.

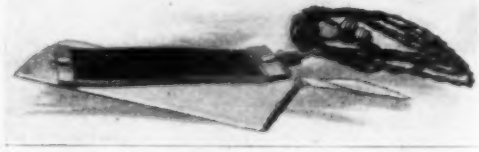


Electric Fan and Heating Unit Which may be Quickly Applied

IMPROVED HEATING PAD APPLIED LIKE BELT

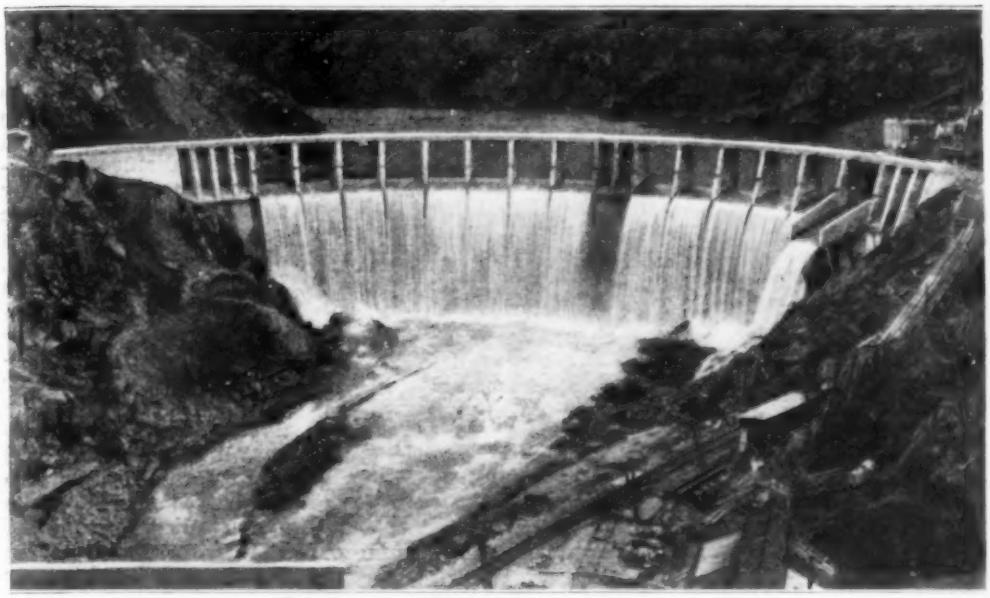
Several improvements in heating-pad design are incorporated in a new device which may be applied to any part of the body and held in place like a belt. The outside covering of the heating element is composed of extremely flexible sheets of phosphor-bronze, which allow the device to conform to any angle or twist of the body. The shell and containing bag may be easily sterilized, the former with an antiseptic solution, the latter by boiling. Among other advantages claimed for the device are that either moist or dry heat may be applied. In the first case, a wet cloth is interposed between

Right: New Heating Pad Applied for the Relief of Toothaches, Earaches, and Neuralgia. Below is Shown the Heating Element, Extension Cord, and Woolen Containing Bag. The Shell and Containing Bag may be Easily Sterilized, the Former with an Antiseptic Solution, the Latter by Boiling



the heating element and the part treated, the covering bag being removed. The temperature control being automatic, the manufacturers declare overheating to be impossible.

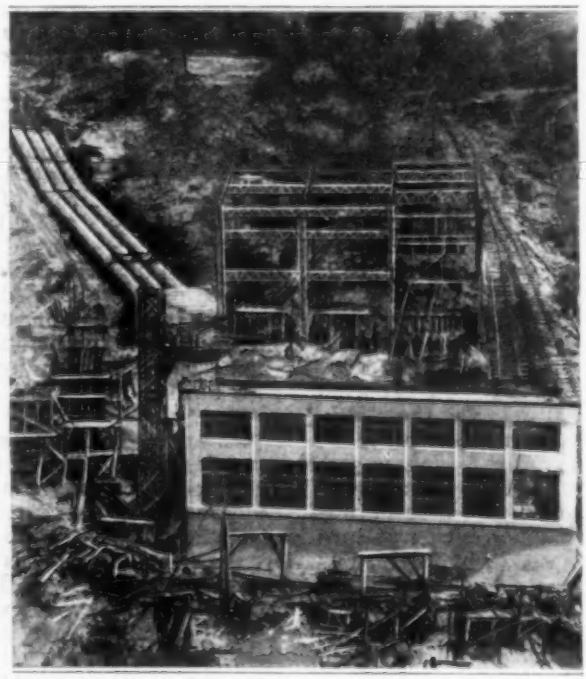
¶ The state of West Virginia is about to erect a memorial to those of her sons who served and died in the late war. This will be in the form of a one-million-dollar gymnasium, convention hall, and community center. It will be situated upon the state university grounds at Morgantown.



This Great Dam, Impounding the Waters of the San Joaquin River, is Built in the Form of a Horseshoe with the Apex Pointing Upstream. Buildings and Rail Lines like Those in the Right Foreground were Constructed in Preparation for the Greater Work

FORMAL OPENING OF HUGE POWER PLANT

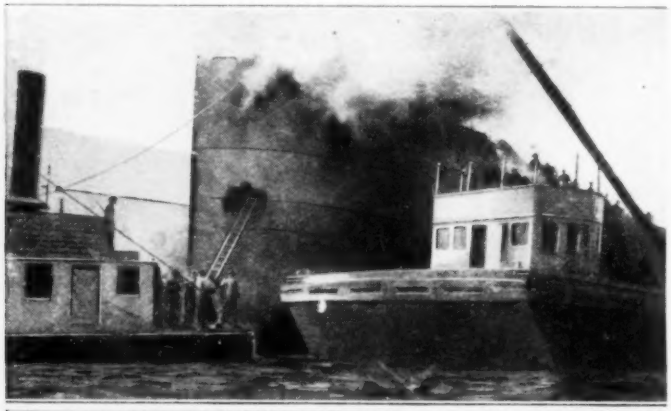
The water was admitted to the 45,000-hp. turbines of the Kerckhoff power plant, located on the San Joaquin River, Calif., on August 15th. This project was put through in record time, excavation having been started June 20, 1919. The conducting tunnel is 18 ft. in diameter and 16,875 ft. in length, and was driven through solid gray granite. At one point it passes under a mountain peak at a depth of 1,000 ft. The dam, containing 24,500 cu. ft. of concrete, is 570 ft. long, 125 ft. high, and impounds 348,480,000 cu. ft. of water, half of which is available for power purposes. The power is generated by three three-phase, 60-cycle, 6,600-volt direct-connected generators, driven at a speed of 360 r.p.m. Auxiliary direct-current generators are used for field excitation and plant control. When the full output of power is utilized, millions of gallons of fuel oil, now being burned for power purposes throughout the section served, will be released. The successful completion of this undertaking marks another great advance in hydro-electrical development.

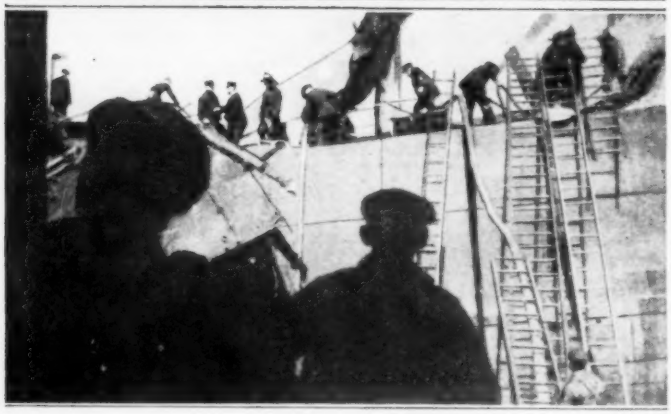


Power House and Conduits: The Latter are Laid through an 18-Foot Tunnel, Over Three Miles Long, Blasted through Solid Granite, at One Point Running at a Depth of 1,000 Feet

EXPLOSION ON OIL-TANK SHIP HAS DISASTROUS RESULTS

With a detonation audible two miles away, an empty oil container on a tank ship lying at a Brooklyn wharf suddenly exploded, a short time ago, while the vessel was undergoing repairs, with 200 workmen aboard. So terrific was the force of the blast that steel plates were torn like paper, and a half-ton propeller blade was hurled 50 ft. Of the workmen, five were killed outright, and many more injured. One of the victims was thrown 100 ft., or more, into the air, taking with him the ladder on which he was working. The steel upper deck was torn off, and one steel plate, 20 by 30 ft., was cast over the side of the ship, while a lifeboat on deck shot high above the masts, and crashed to splinters on the dock. The ship's cargo of oil had been discharged 10 days before, and presumably had left a residual atmosphere of inflammable vapor among the tanks.





Top: The Tanker Just after the Explosion, with the Rescuers Helping the Victims Out of the Anchor Hole. Bottom: Firemen Working among the Torn Steel Plates of the Deck

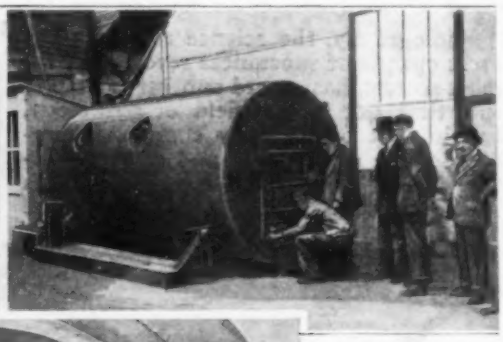
SELENIUM AVIATION COMPASS PLACED ON TAIL OF PLANE

A new aeronautical compass, called a distant type, mounted at the tail of an airplane, is thus removed from the disturbing magnetic influences set up by the iron of the engine and the inductive effects of magnetos and coils. It depends for its action upon the peculiarity of the element selenium to vary in electrical conductivity with the volume or intensity of light falling upon it. In the new compass the indicator card is perforated with two specially shaped slots which allow beams of light from two bulbs in the compass bowl to play upon two selenium cells mounted on a bridge across the top of the instrument. As the intensity and volume of the light beams vary with the position of the slots in the indicator card, a current constantly flowing through the selenium cells is altered in value. These current fluctuations are indicated by a specially calibrated ammeter mounted on the instrument board directly in front of the airman. The indications are interpreted in terms of changes in direction. When both navigator and pilot are carried, the former may change the direction of flight, without the necessity of communicating his orders to the latter, by turning the whole compass bowl.

¶Armorers of ancient days often achieved fame for the quality of their metal suits, but their secrets are an open book in the light of modern metallurgical analysis and microscopy. Sections of iron cut from some 12 samples of old armor and examined by the U. S. Bureau of Standards reveal that a pure wrought iron was used, carbonized into steel by cementation, hammered into sheets, and welded together. The completed suit of armor, after shaping, was then hardened by quenching.

SEVEN AND HALF MILES HIGH IN MOCK FLIGHT

Careful Blood-Pressure Tests were Made before and Immediately after the Experiment



Sealing the Doors of the Air-Tight Cylinder: The Subject was Watched through Windows

PHOTOS BY MEURISSE, PARIS

When the Pressure in the Cylinder had Dropped to a Point Equaling That at a Height of Over 2½ Miles, the Mask and Oxygen Tank were Resorted to

A lieutenant of the French aviation corps recently successfully subjected himself to a test to determine whether or not life could be sustained at 12,000 meters (39,360 ft., or about 7½ miles) altitude. Entering a large air-tight cylinder, the signal to start the exhaust pump was given. At a pressure corresponding to an altitude of about 13,500 ft. (2½ miles), the experimenter was compelled to resort to a specially designed mask and an oxygen tank. At about 30,000 ft. (5¾ miles), observers noticed that he seemed to experience difficulty in moving his limbs. This is an experience reported by all aspirants to the altitude record. When the pressure had dropped to a figure corresponding to the height of about 34,000 ft. (6½ miles), the subject closed his eyes as though weary. As the barometer touched a figure equal to a height of 39,360 ft., the trial was stopped and air slowly admitted to the cylinder that there might be no disastrous shock. The mock ascent took 47 minutes and 30 seconds, while the descent was accomplished in 17 minutes. The experiment demonstrated that, so far as atmospheric conditions are concerned, human life may be sustained at great heights. The lieutenant expects to make use of the experience in a future attempt to establish a new international altitude record.

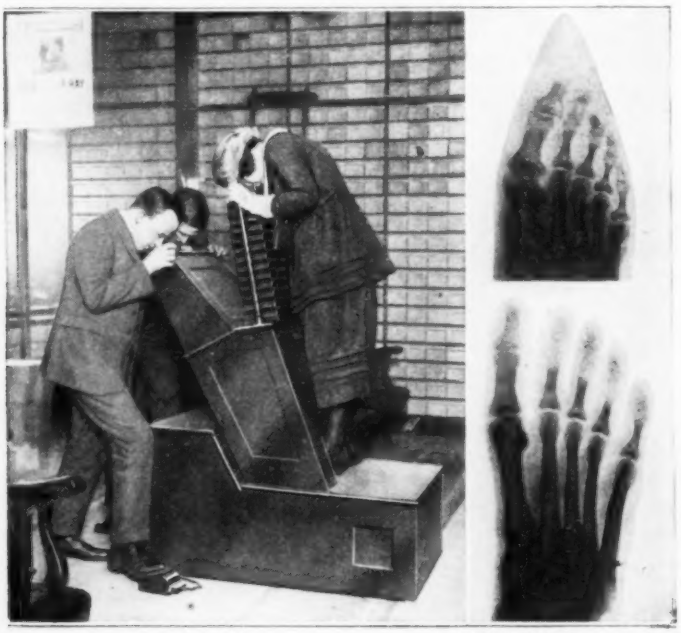
TIRE TOOL SPREADS CASINGS WITHOUT OBSTRUCTION

By working from the outside of the casing, instead of the inside, a new form of tire-spreading tool opens the heavy rubber without leaving any obstructions in the way of the worker. The jaws are on two arms, centrally pivoted at the ends of a yoke that embraces the tread side of the tire. A chain-and-toggle lever connects the opposite ends of the arms, and when they are brought together, the jaws pull the casing open. Particularly intended for large truck tires, three of the tools, equally spaced, will keep a casing open.

Left: Sectional View of a Casing with the Tool Applied. Right: The Casing as It is Spread Open

X-RAY MACHINE FITS SHOES CORRECTLY AND RAPIDLY

Radiography, the science to which the most opaque of substances reveal their inmost secrets, has scored another triumph; this time not in the field of pathology, but in that of the very common everyday service of selecting and correctly fitting proper shoes. An X-ray apparatus has been brought out for use in shoe stores, by means of which the purchaser and the salesperson can see whether or not the bones of the foot are distorted or restricted by the shoe being tried on. The device will not only settle any controversy which may arise as to proper size, it will also show, without leaving chance for argument, whether a shoe is of the correct design and shape. The apparatus consists of an odd-shaped cabinet in the base of which are the X-ray tube, transformer, etc. Three eyepieces are provided in order that the customer and two other persons may observe and pass upon the perfection of the fitting. One of the eyepieces is equipped with a bellows, of the type found on cameras, so that customers of various heights may observe without much stooping or stretching. The bellows folds down sufficiently to allow even the average five-year-old child to make the observation easily. The X-ray beam is so confined that no other part of the body is exposed to it.



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Left: The X-Ray Shoe-Fitting Apparatus in Service. The Feet are Inserted in an Aperture Directly under the Fluorescent Screen. Right, Above: The Effects of Cramping the Foot. Right, Below: The Bone Structure of a Foot That has Never been Abused

PROPOSE MAKING SING SING A PRISON CLEARING HOUSE

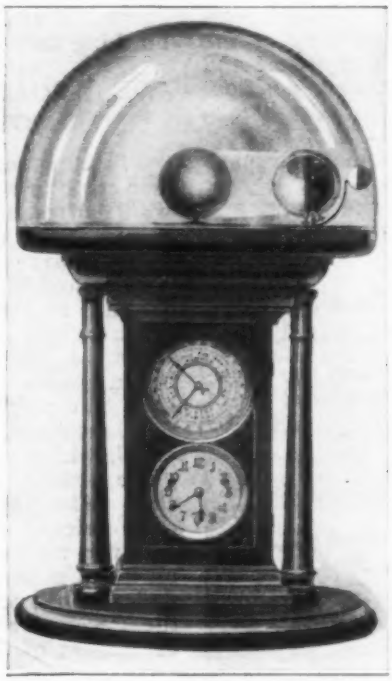
A proposal entirely to discontinue the use of Sing Sing as a prison and convert it into a clearing house and classification bureau of criminals and other defectives has been advanced by the New York State Prison Survey Committee. The plan is now being tried on a small scale. Various reasons are given in support of the movement, among others being that it is an injustice to compel individuals of normal mentality to work in close association with those of subnormal development, or of such marked criminal tendencies that association with them has a contaminating influence. The recommendation of the committee lays stress upon increasing the productive efficiency of prisoners, thus aiding in their reclamation to themselves and to society by restoring their self-respect. It is thought that by classifying the various grades of criminals, morons, and other mental defectives, and confining them in institutions especially equipped to care for each class, a bettering of the penal system and of production will be effected.

WHITE ELECTRIC-LIGHT GLOBE SHOWS RED AT NIGHT

Urgent need of a red light at a dangerous street point in Baltimore recently resulted in the discovery, by a city official, of a new type of electric-light globe that is white in the daytime, and red when lighted at night. One of the milk-white globes known to the trade as "opal" is simply coated inside with ruby-red dye. The reflected light of day naturally fails to show the colored lining, but the rays transmitted through from an electric filament within are all red. It is planned to use the new globes for a number of municipal purposes.

UNIQUE ASTRONOMICAL CLOCK HAS SHINING SUN

An Illinois artisan, formerly a master-clock builder and instructor, has, after five years' effort, produced an unusual astronomical clock in which the earth is illuminated by phosphorescent rays from the sun and moon. By means of correctly designed pinions the miniature earth is made to revolve 365¼ times while making one circuit of the sun and, as it is tilted at a 23½° angle, the seasonal changes are plainly shown. The moon makes the circuit of the earth in exactly the right time, keeping one side earthward continuously and going through all the phases and eclipses. In partial darkness the rays from the sun can be seen lighting up the earth and extending past the north pole in summer and beyond the south pole in winter. The rays from the moon are fainter and the illumination from it is in proportion to that from the sun. A large dial above the regulation clock dial keeps accurate track of the seasons, months, days, and hours. The special parts may be disconnected from the clockworks, by which they are generally driven, and connected to a small electric motor built into the back of the clock. When driven in this way, the globes will complete the evolutions, normally requiring a year's time, in 10 minutes. This novel feature will prove of interest to school boards and the management of other educational institutions.



In This Astronomical Clock the Earth and Moon Movements Are Correctly Timed. The Rays of the Really Luminous Sun are Seen Shining beyond the North Pole

MOVIES OF MOTOR-CAR PARTS MADE WITH PAPER CUT-OUTS

If it were possible to take a cross section of any mechanism, and have it continue to operate with its insides visible, much would be gained in the way of education. Thanks to the many-sided movies, this remarkable species of mechanical vivisection actually has been achieved, at least so far as certain motor-car details are concerned. Looking at the screen while one of these interesting pictures is being projected, the spectator appears to see the freshly cut faces of pipes, valves, cylinders, and other intimate parts, that have been sawed in two down the middle, but all performing their

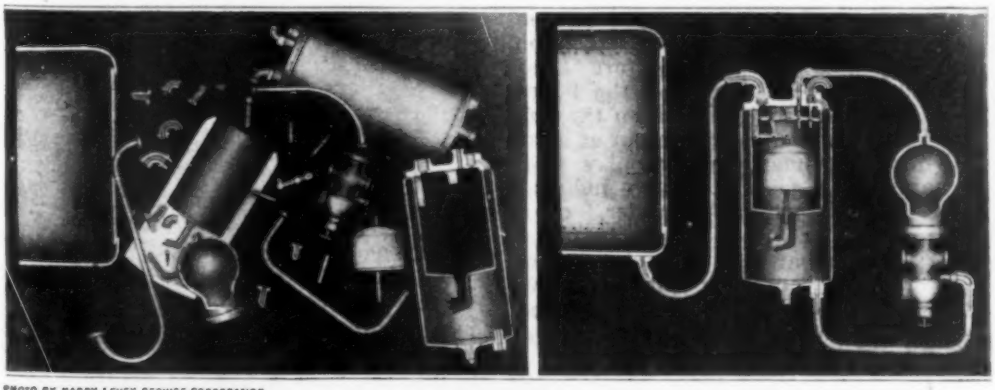


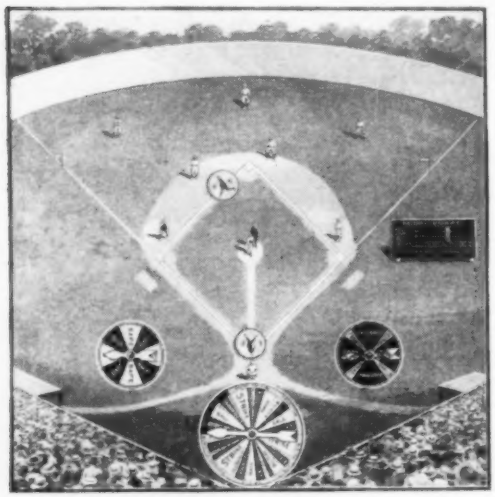
PHOTO BY HARRY LEVEY SERVICE CORPORATION

Left: The Multitudinous Parts of an Auto Vacuum-Feed System, as Duplicated in Section with Fiberboard Cut-Outs for Making Movie Pictures. Right: The Assembled Sectional Working Model as Photographed

usual functions. This startling result is accomplished by making accurate fiberboard cut-outs of each detail, properly assembling them, and then moving the related parts one tiny step at a time and taking one photograph of each position. The succession of pictures, perhaps taking days to make, shows, when rapidly projected, a smoothly running mechanism. Making the cut-outs was a task of infinite pains, one device alone, the vacuum gasoline feed, requiring more than 100 separate pieces.

NEW PARLOR BASEBALL GAME HAS ALL REGULAR PLAYS

Outdoor games brought into the house and played by moving pieces on a board are usually but anemic substitutes for



The New Parlor Baseball Game, Lithographed in Realistic Imitation of a Regular Field: Three Pointers Permit All the Plays of a Real Game

the real thing, but a new parlor baseball game seems to be a marked exception. The field and its diamond are lithographed most realistically on the board, even to the advertising signs on the outfield fence. A round piece is put at home base for a batsman, and the play made by spinning a pointer, which indicates "strike," "ball," "fly," "grounder," or in fact any of the list of events that may occur to a man at bat. Another pointer, spun by the opposing player, shows whether the ball is caught or fumbled, and a third pointer gives the decision of "safe" or "out" when a runner steals a base. Between these three pointers, all the plays can be made that occur in a real game, and the space given to each dial division is accurately proportioned from a study of the records of 75 "big-league" games. A recording scoreboard gives the finishing touch to the outfit.

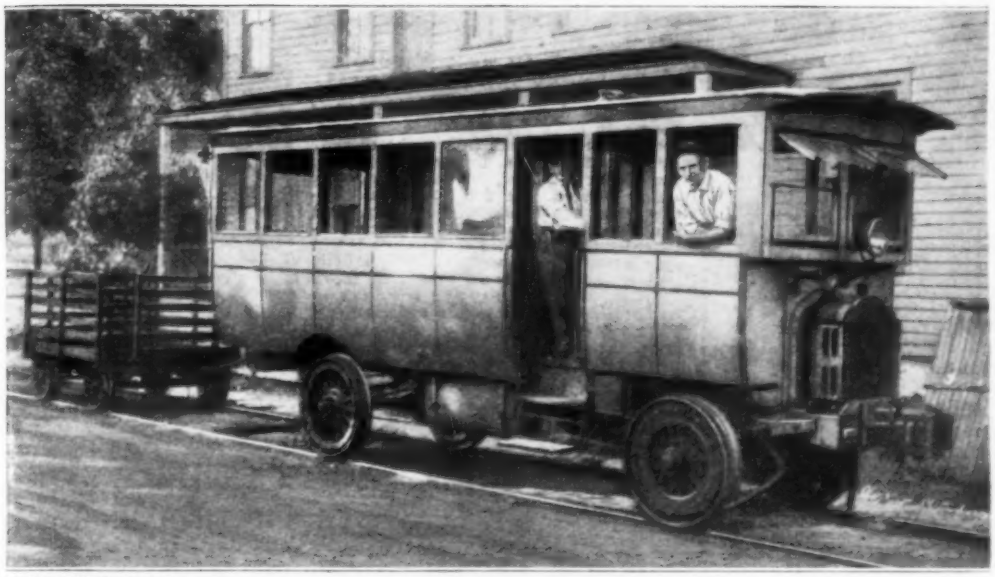
WEST-COAST NAVAL AIR FLEET IS NOW ESTABLISHED

Provision for aerial defense of the Pacific coast of the United States took form with the recent shipment, from Cleveland to San Diego, of a fleet of eight big naval torpedo planes. The planes are designed to take off from ship deck, and have a cruising radius of 400 miles. Each machine carries a 1,650-lb. torpedo, 450 lb. of bombs, two machine guns, a radio set, and a crew of pilot, navigator, and gunner. The weight, with loads, is 11,910 lb. For landing at sea, flotation bags are provided, which are inflated just before the plane descends, to be hoisted on board ship. The planes will also be used at coast-defense stations. A train of 23 cars was necessary to carry the big shipment. A number of super-seaplanes now under construction, capable of crossing the Pacific Ocean, will form the second contingent of the new defense work.

IMPROVED TOY BICYCLE SLED WHICH INSURES TRACTION

An improvement in bicycle-sled design consists of a number of spurs which may be caused to protrude from the rim of the drivewheel, at the option of the rider, the control being by an easily operated lever. The wheel, being shod with rubber, exerts sufficient tractive effort to move the sled over a level roadbed of snow or slush, according to the claims of the inventor. On up or downgrades or icy surfaces, the spurs may be brought into service, when they exert additional tractive force or assure certainty of brake action.

Above: Details of the New Bicycle Sled. Right: The New Toy in Use. The Spurs in the Rim of the Drivewheel are Not Shown



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A Combination Passenger Car and Locomotive, the Power Plant, Frame, and Axles of Which at One Time Served in a Motor Truck: This Novel Coach Accommodates 35 Passengers Comfortably and, Together with the Trailer Freight Car, Constitutes the Greater Part of the Rolling Stock of a 12-Mile Interurban Railway

CONVERTED MOTOR TRUCK SERVES AS RAILWAY CAR

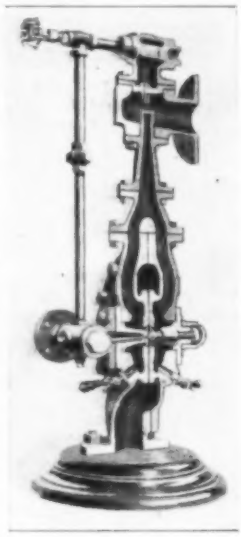
The versatile automotive vehicle continues to prove itself adaptable to unexpected purposes. An Illinois interurban line, 12 miles in length, operates a combination passenger coach and locomotive having as its basis a motor-truck chassis. Flanged wheels have replaced the stock type, and a few other minor changes have been made. The substantial coach body, which resembles a motor bus, accommodates 35 passengers. Freight is carried on a trailer.

TRACTOR SNOWPLOWS TO KEEP NEW YORK STREETS CLEAR

Lessons of the past few winters, when unexpectedly heavy snows closed many city streets and caused losses of millions of dollars, have determined the street-cleaning department of New York not to be caught napping this season. After an exhaustive series of tests, in which sand piled on the pavement was used to try the strength of competing machines, 50 large and 100 small endless-tread tractors equipped with push plows have been ordered. These machines have been found capable of clearing away the deepest accumulations of snow, and can work effectively in the midst of the storm. A large new fleet of dump-body trucks will serve the tractors.

HIGH-CAPACITY VACUUM PUMP WORKS LIKE INJECTOR

The word pump suggests, to the average person, an apparatus consisting of pistons, cylinders, valves, and other complicated moving parts. A new type of vacuum pump, for use with turbines, in which there are no moving parts, the vacuum being created by a radial jet which forces the steam to assume the shape of a disk, has been adopted by the U. S. Navy. As the speed of the live high-pressure steam is 3,000 ft. per second and that of the low-pressure exhaust steam much less, the latter is drawn through the pump at a greater speed than that at which it is exhausted from the engines or turbines, thus relieving the latter of back pressure. The new pump, which is thousands of pounds lighter than any previous apparatus, requires no foundation and effects a saving in floor space.



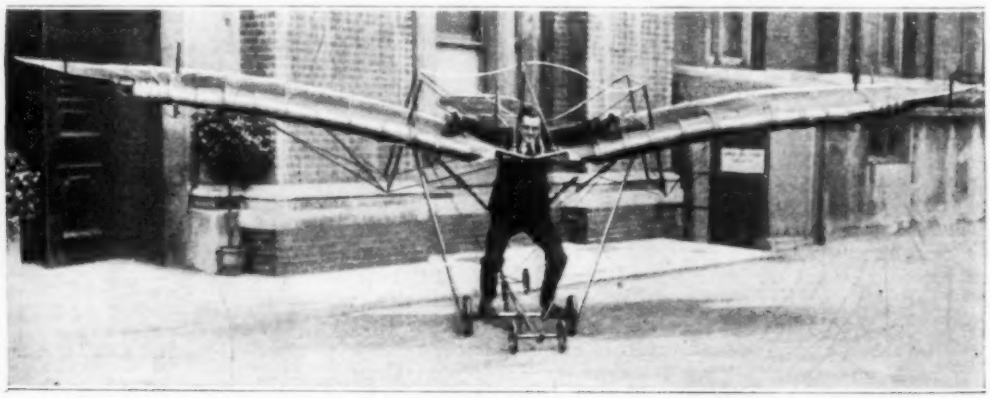
PLAYS VIOLIN BY TELEPHONE TO MOTHER ILL IN HOSPITAL

Many a bedridden invalid has had reason to bless the versatile and ubiquitous telephone, when it brought literally into the sick room the voices of those most sorely missed, or the comfort of divine service. In few instances, however, has the matter-of-fact instrument contributed more largely to practical sentiment than in the use to which it is put by a certain noted violinist. The artist's mother lay seriously ill in a New York hospital, but every day the telephone at her bedside brought to her ear a strictly private concert in her talented son's best style. Before the transmitter in his own home, some distance away, he played the familiar airs that exercised a beneficial effect, physicians say, on her condition.

BOLL WEEVILS BURNED IN CITY STREET

One of the Boll-Weevil Piles Ready for the Match: This Pile Represents Several Dollars, as It was Paid for by the City Merchants at the Rate of 25 Cents per Gallon

Public-spirited merchants of Longview, Tex., paid the farmers a bounty of 25 cents per gallon for boll weevils. Upon the accumulation of enough of the pests to make a worth-while pile, oil and a match were applied. This section of the state suffered but slightly from the depredations of the weevils, as the plan was adopted early in the visitation and, it is believed, did much toward retarding propagation of the destructive insects.



ORNITHROPTER MAKES FLIER REAL BIRDMAN

SINCE the days of Darius Green, flying machines depending upon the principle of the flapping wing have been viewed with tolerant amusement, but never with seriousness. Comes now a genius who claims to have so nearly perfected such a machine that sustained flights at 15 to 20 miles an hour are a possibility. The new machine has a wing spread of 23 ft. 6 in. and an over-all fore-and-aft dimension of 14 ft. The use of an aluminum alloy has been of great assistance in avoiding weight, the complete apparatus weighing but 47 lb. In general construction the machine adheres closely to proven and accepted aeroplane engineering practices.

OXYGEN-ABSORPTION CAPACITY VERSUS LUNG CAPACITY

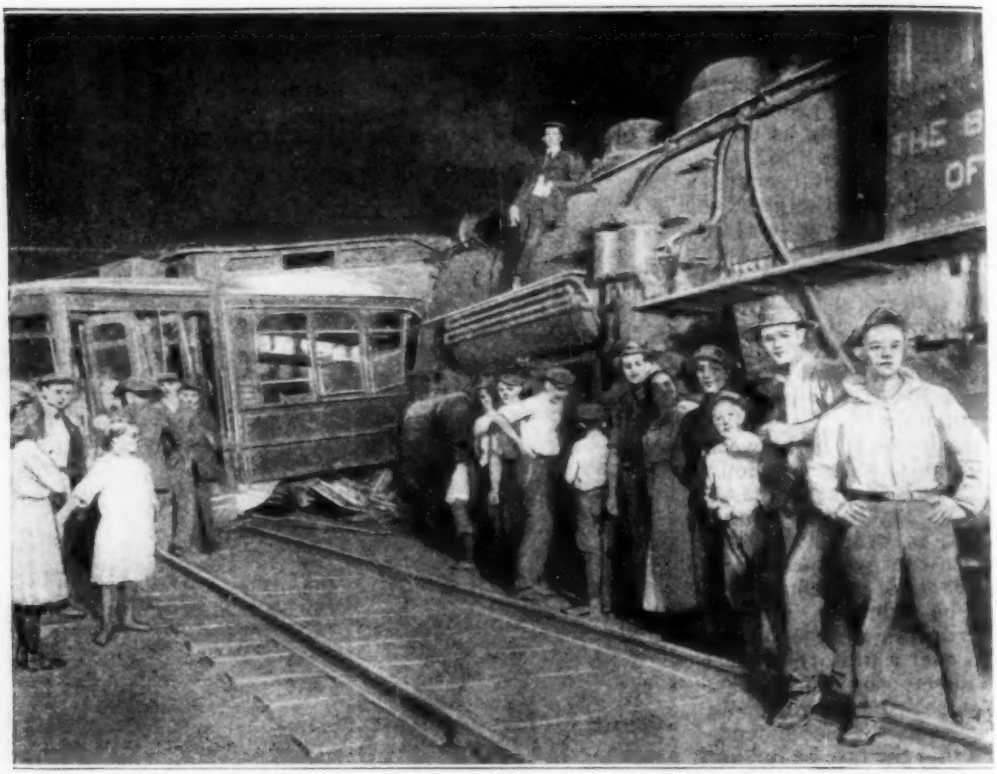
During a recent series of experiments performed by prominent medical authorities and having as one of its objects the determination of the amount of vital energy expended by the average person walking certain distances, under certain conditions of load and path, the rate of speed at which the subject, bearing a pack weighing 43 lb., should travel in order that his forces be most economically expended, was found to be between 2.6 and 3 miles per hour. As the load was increased to 45 lb., it was found, that, in order to economize energy expenditure, the rate of movement had to be reduced. The experiments were conducted over a uniformly level and smooth path. Should the path be rough, or an upgrade, it is recommended that the rate be further reduced. It was also found that endurance is largely a matter of respiration and oxygen absorption. Workmen, accustomed to heavy labor and consequent great oxygen absorption and oxidation, have greater endurance than those performing tasks in which muscular effort is not required, this, for the reason that the former have developed the ability to oxygenate the blood and tissues thoroughly and actually build up a surplus fund of secreted oxygen, which may be drawn upon as the occasion may demand. This discovery has an important bearing on the subject of respiration in relation to fitness, because it upsets the theory that all that is necessary to oxygenate the human system is consistent deep breathing and a consequent increase in lung area. The conclusion reached, in the light of the results of the experiment, is that the ability to absorb and store oxygen is dependent upon muscular activity rather than upon so-called lung power and area.

SPECTACULAR DIVE BY HUMAN SMOKE ROCKET A THRILLER

A dare-devil of the films has originated the "smoke dive." With a score or more smoke bombs attached to his rubber suit, belching forth a most effective smoke screen, he makes a breath-taking 100-ft. dive. This is a variant of the fire dive in which the diver became a meteor during his flight. While the fire dive was somewhat more spectacular than is the smoke dive, it has been discontinued for the reason that fatal accidents were too frequent. Aside from the danger inherent in any high-diving feat, the hazards of the smoke dive are not great. The smoke bombs are of the same sort as are used in moving-picture forest-fire and other conflagration scenes. One creates a fog, and the number used almost hide the performer.

Diver with Smoke Bombs Attached to His Rubber Bathing Suit: One Fuse Fires All Bombs

Start and Finish of the Smoke Dive, an Amusement-Park Feature: With a Number of Bombs Pouring Out a Cloud of Smoke, the Performer Makes the Dive. The Dense Smoke Screen Adds a Spectacular Effect to the 100-Foot Jump



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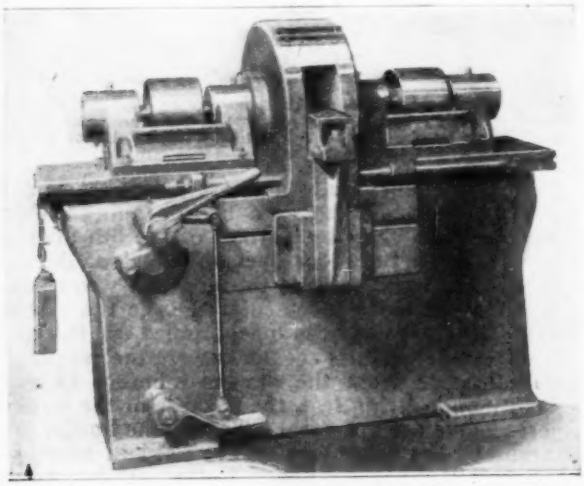
TROLLEY CAR STRUCK BY LOCOMOTIVE IS CARRIED TWO BLOCKS

EXEMPLIFYING the well-known perversity of inanimate objects, the trolley of a heavy electric car chose to jump off the wire the other day in Chicago, right in the middle of a railroad track. Approaching at 25 miles an hour, and only 100 ft. away when the car stalled, was a freight locomotive hauling a 100-car train. Fortunately for the 70 passengers, the car conductor retained his judgment, and advised an immediate exit. It was this hurried departure, and not the subsequent impact, that broke all the windows in the car, during which process many passengers were cut and bruised, but none seriously injured. The locomotive, with its brakes set but unable to stop, struck the car fairly amidships. It was carried two full blocks before it came to a pause on the edge of a steep decline, with its steel side smashed in.



A Disk Grinder for Grinding or Finishing Two Opposite, Parallel Metal Faces, Such as on Piston Rings, Nuts, and Similar Parts: The Work is Held in a Fixture between Two Grinding Wheels

NEW DOUBLE-SPINDLE DISK-GRINDING MACHINE

For the particular purpose of grinding or finishing two opposite parallel faces, such as on piston rings, nuts, drop-forged wrenches, and a large number of similar articles, a double-spindle disk-grinding machine has been put on the market.

Two grinding wheels are carried on spindles and are driven independently of each other, their faces being parallel with each other. One of the grinders is mounted on a sliding head provided with a positive micrometer stop. The work is held in a suitable fixture between the abrasive surfaces of the grinding disks.

DAMMING A LAVA-BOTTOMED LAKE TO INSURE A CITY'S WATER SUPPLY

BY HORACE E. THOMAS

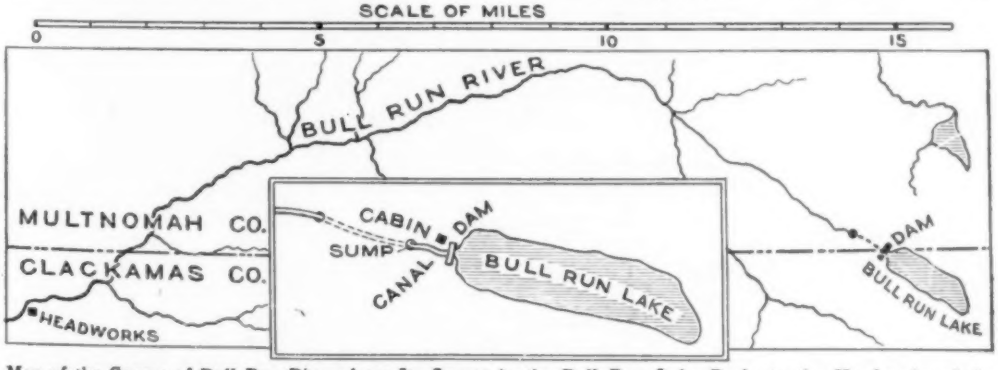
BY a simple, yet successful, engineering expedient, the ever-present bogey of a summer water shortage has been banished from Portland, Ore. A great reserve of more than 2,000,000,000 gal. has been created to augment the existing supply, the feat being an interesting development in one of the most remarkable municipal water systems in America.

A View of Bull Run Lake from the Mountainside: This Curious Lava-Bottomed Lake Has No Visible Outlet, Its Water Escaping through Underground Passages and Fissures, Making Especially Difficult the Problem of Converting It into a Reservoir

The reserve supply was made possible by damming Bull Run Lake and controlling the impounded water by a gateway through the dam. The project was begun two years ago, when dams were built to shut off arms of the lake into which, in winter, the water flowed over natural spillways. By this process, which was complicated by the character of the lake bottom, as will be explained later, the surface of the lake was raised about 10 ft. and the added volume of water held until the dry summer months. Then, while a temporary retaining wall held back the water, an artificial outlet was created and closed by a permanent dam, so that the water might be released at will to compensate for the natural diminution.

Bull Run Lake is unusual in that it has no surface outlet. It is located in a basin of the Cascade Mountains, with virgin forests surrounding it on all sides. The summit of Mount Hood is less than six miles distant and stands like a snow-clad sentinel, apparently so close that one could almost reach out and touch it. The lake was originally formed by the deposit of glacial material around a bed of volcanic lava. This lava bottom is very irregular and frequently broken by tunnels and crevices. Through these openings the water seeps out to burst forth in two huge springs in a rocky cañon a mile from the lake. These springs are the beginning of Bull Run River.

It has been presumed that Bull Run Lake was thus the source of the river, although it has been a subject of controversy, and engineers never were certain of it until the present outlet was created. At times, coloring matter has been put in the lake in an attempt to trace the course of the seepage, but it was impossible to detect discoloration in the springs. Either because the



Map of the Course of Bull Run River, from Its Source in the Bull Run Lake Basin to the Headworks of the Portland Water System: The Insert Indicates the Location of the Dam and the Underground Stream

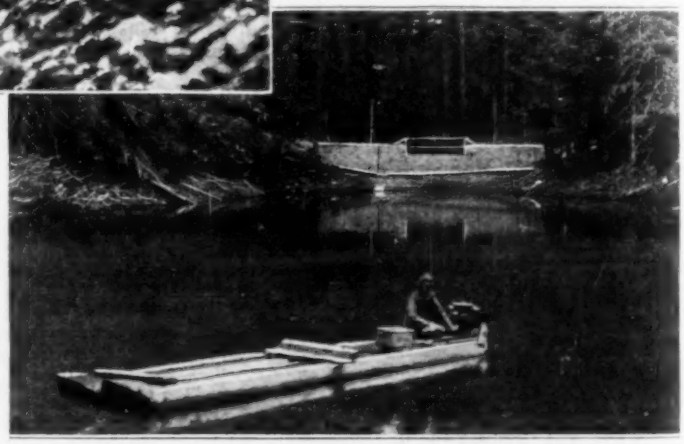
body of water is so large, or due to the natural filtering action of the lake's bottom, the coloring matter entirely vanished.

When the new dam was completed, the temporary dam was dynamited, and the water released against the permanent barrier. Then, as the gate was raised, the water rushed down a gulch and into a natural sump, where it disappeared. Within a few minutes engineers, who were watching the springs a mile away, observed the flow noticeably increase. Twelve hours later the added flow was apparent at the headworks of the Portland water system, 22 miles down the river. The increased flow at the springs demonstrated for the first time that the lake and river were connected by underground passages, and made certain the success of the new project.

The Artificial Outlet of Bull Run Lake, Which can be Increased in Flow, or Shut Off Entirely, by Operating the Gate, Thus Helping to Adjust the Augmented Storage Capacity of the Lake

The most serious problem in carrying out the development was to retain the surplus water of winter until the summer season. Had there been a surface overflow, it would have been easy to dam it and thus hold the water in storage; but the submerged outlets were more difficult to control. Obviously the flow through these unseen openings would become greater as the water was deepened by the winter freshets, and the streams would gain headway as the depth and consequent pressure increased. Thus, due to these hidden channels, the lake at the beginning of summer would not be much above its average level.

Some of the seepage was stopped by damming the lake where it threw out arms during high water. Then rock and gravel were dumped into the shallows to close up the natural fissures. This blanketing process will be continued in order to put the flow from the lake as completely as possible under control. Absolute control, of course, would come only when all the submerged openings were closed, which is impossible because of the depth of the water and the great quantity of material that would be necessary to blanket the entire area of the lake bottom. The lava formation does not extend above the lake's surface, so that the rising water does not encounter new outlets. On the contrary, the high water exposes an embankment of glacial deposits that will tend to wash into the lake and assist the artificial process of reducing the leakage. Already consider-



In the Background Is the Temporary Dam, across the Arm of the Lake, That was Blasted Out After the Permanent Dam was Finished. In the Foreground Is a Forest-Built Scow Used for Hauling Material

The Construction of the Bull Run Lake Dam, Making a Natural Reservoir That Saved the City of Portland Nearly $4,000,000, Which would have Been Necessary for Artificial Reservoirs: The Channel of the New Outlet is Varied in Flow by a Gate in the Permanent Dam at the Left

The White, Barren Strip through the Forests That Border the Lake, as Seen at the Left, Is a Firebreak. A Strip 100 Feet Wide is to be Cleared and Cleaned All around the Lake, as a Barrier to Any Forest Fires That might Sweep over the Mountains

able progress has been made in this direction.

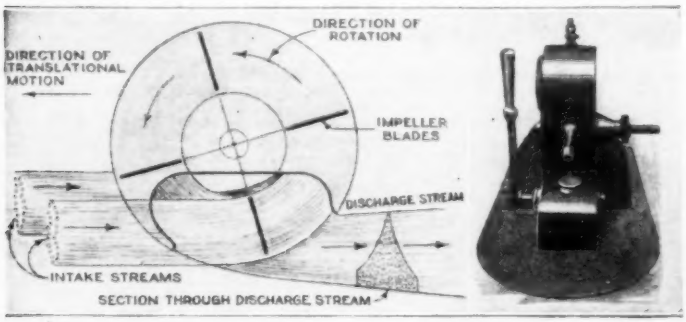
Before the plan to control the water of the lake was originated, it was thought that reservoirs must be built, and they had already been designed, to cost between $3,000,000 and $4,000,000. The expense of the work just completed was less than $40,000, and the blanketing process that is still going on is not costly. The task has been accomplished with considerable difficulty, as all supplies and equipment had to be carried in by packhorses. One donkey engine was hauled in on a sled, but it was next to impossible to transport heavy machinery, and all the timbers of the new dam were hewn by the tedious process of hand labor.

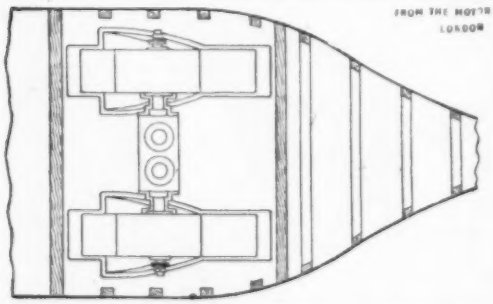
Portland's maximum water consumption is about 50,000,000 gal. a day. In hot weather, when Bull Run River is at its lowest stage, the total flow was utilized and city officials feared that a prolonged dry spell might cause a serious shortage. The new impounding system makes it possible to double the flow of the river at any time. An added 50,000,000 gal. a day could be turned in for a period of nearly two months without exhausting the surplus, so that it is evident the city's water problem has been solved for many years to come.

There is telephone connection between the headworks and Bull Run Lake, and the water will be released exactly as it is required, to supply the two pipe lines that carry it to the city reservoirs.

SIMPLE HYDRAULIC PROPELLER UTILIZES JET PRINCIPLE

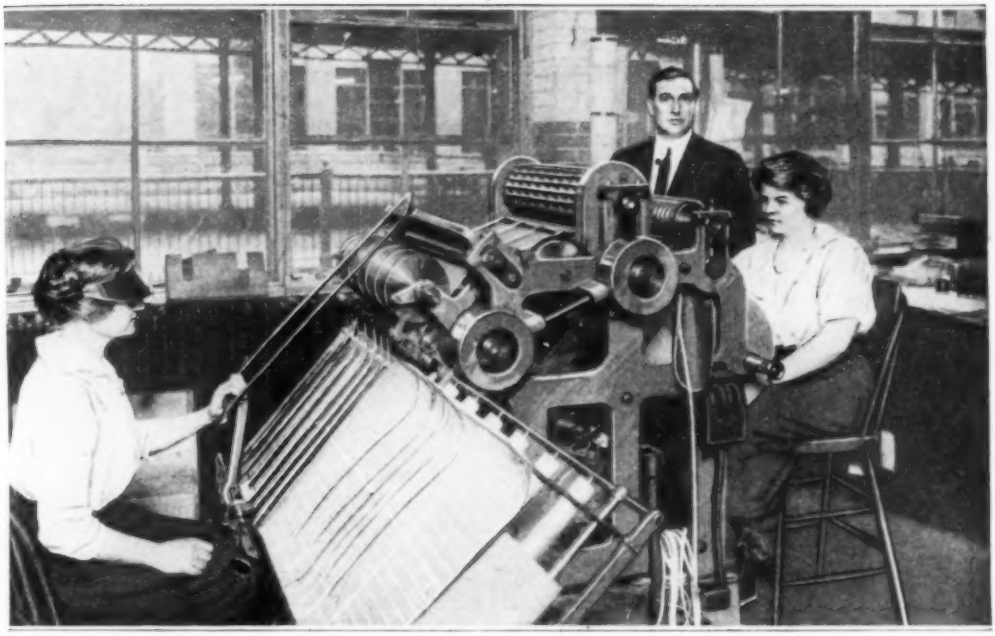
The jet-propulsion idea has been embodied in a new propeller which is undergoing tests in England. Some novel features are found in the new device. Probably the most valuable of these is the arrangement for varying the position and area of the ports, as by this method of control it becomes quite practicable to operate the source of power, steam or gas engine, at that constant speed rate at which maximum efficiency is realized. The propeller consists of two concentric drums and an impeller of the simple, paddle-wheel type. Both drums are pierced by ports which may be brought into register by rotating the inner drum by means of a manually operated lever. The water is taken through two ports, one on each side of the propeller, and ejected through one port located in the periphery. It is the latter port, in the inner drum, which is moved into register with corresponding ports in the outer, immovable drum, by rotating the inner member through an angle of approximately 50°. The ports in the outer drum discharge in fore or aft direction. When one of the outer ports is uncovered the opposite port is, of course, inoperative. Thus all rates from full speed ahead to full speed astern may be attained, and as the action of the propeller is reversible without reversing rotation, it may be directly connected to any internal-combustion engine without the interposing of the usual reversing gear. It is claimed that, as the volume of water passing through the propeller in a given time is large in comparison with the weight of the apparatus, slippage has been reduced to such a degree that the efficiency of the new type compares very favorably with that of the conventional screw propeller.





FROM THE MOTOR BOAT, LONDON

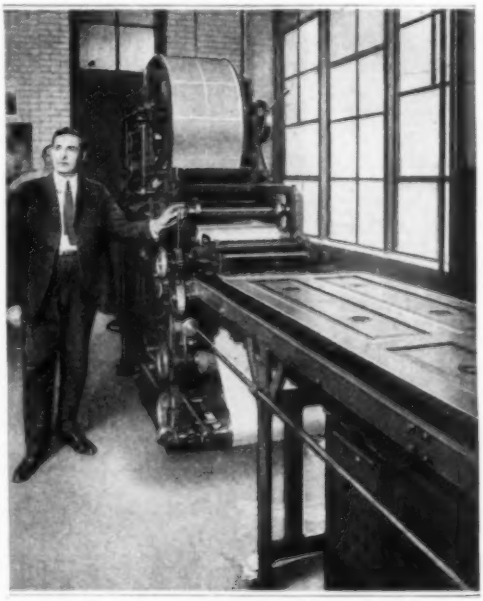
The Top View Shows the Inner Drum and Impeller of the New Jet-Type Propeller. Immediately to the Right Is the Complete Unit Showing the Control Lever. The Lower Illustration Depicts Two Propellers Coupled to One Engine



The Perforating Machine, Which Makes the Lines of Little Holes between the Stamps, Punching Both Lengthwise and Crosswise Rows at the Same Time, and Kept under Adjustment by the Operators

AUTOMATIC PRESSES PRINT STAMPS BY THE MILLION

Few labor-saving machines are more ingenious in combining a number of operations, or more impressive in the amount of work they do, than the new stamp-printing presses of the U. S. Bureau of Printing and Engraving. Each press, with two operators, moistens, prints, gums, dries, and rolls a total of 4,000,000 postage stamps in an eight-hour day. Paper from a roll, 18½ in. wide and 24 in. in diameter, passes through feed rollers, around a drum that moistens it, and then is printed from engraved plates. Fluid gum is next spread automatically over the back, and the strip enters a long, horizontal drier. By the time it returns to the press, it is dry, and is wound in three 16 to 18-in. rolls.



The Ingenious Press That Prints and Gums 4,000,000 Postage Stamps a Day, with the Drier in the Foreground

From the press these rolls go to the perforating machine, which has a capacity as high as 8,000,000 stamps a day with two operators. The perforations are made both lengthwise and across, both the roll and the punches being adjustable for position. One operator, in front, takes care of the unwinding roll and adjusts its path to the perforators by means of a screw. The other operator, at the rear, regulates the speed of the machine and inspects the finished work. Finally, the roll is cut into sheets of 400 stamps each.

Somewhat similar machines have also been made for the new system of marketing stamps in air-tight, sanitary rolls of 500 or more. The coiling or roll machine is run by one operator, and handles 800,000 stamps a day.

CHRISTMAS-TREE FLASHER MAKES LIGHTS TWINKLE

A novel accessory, in the form of a diminutive flasher to be screwed into any electric-light socket, makes Christmas-tree lights flash on and off at short intervals, thus causing a twinkling starlike effect which creates great enthusiasm among the little ones.

The value of twinkling lights as a store-window attraction is well known. The device is said to operate equally well on direct or alternating current. The make-and-break mechanism operates on the thermostatic principle.

ATTRACTIVE VEHICLE MADE BY INCASING MOTORCYCLE

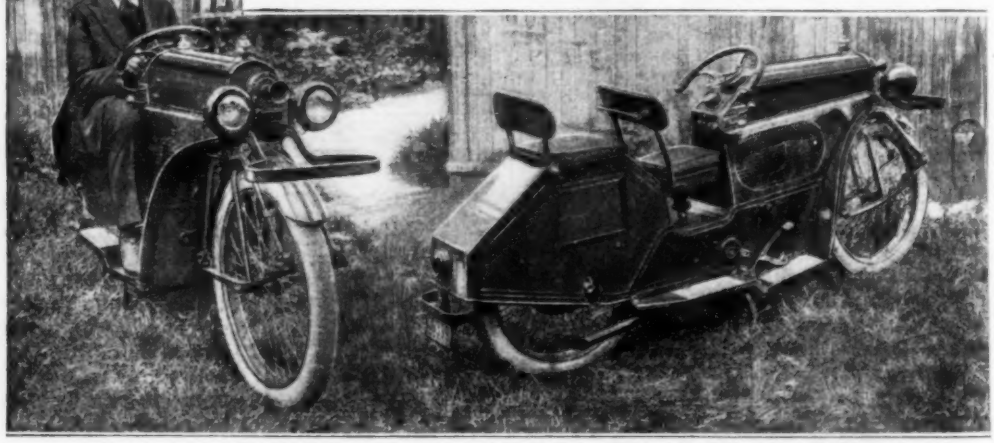
A motorcycle that has all of its moving parts inclosed, and yet readily accessible, presents an appearance of power and comfort that the ordinary motorcycle lacks. This vehicle represents the personal ideas and skill of a motorcycle enthusiast. The designer has increased the comfort of the machine by supporting the front wheel on leaf springs. A steering wheel of unusual form is used instead of the conventional handlebars, and the machine is steered in almost the same manner as an automobile. It is driven by a two-cylinder engine, is equipped with electric generator and starter, a three-speed transmission, and a standard sidecar can be attached if more than two passengers are to be carried.

HOUSEBOAT WILL TOUR CHINA WITH ELECTRICAL DEVICES

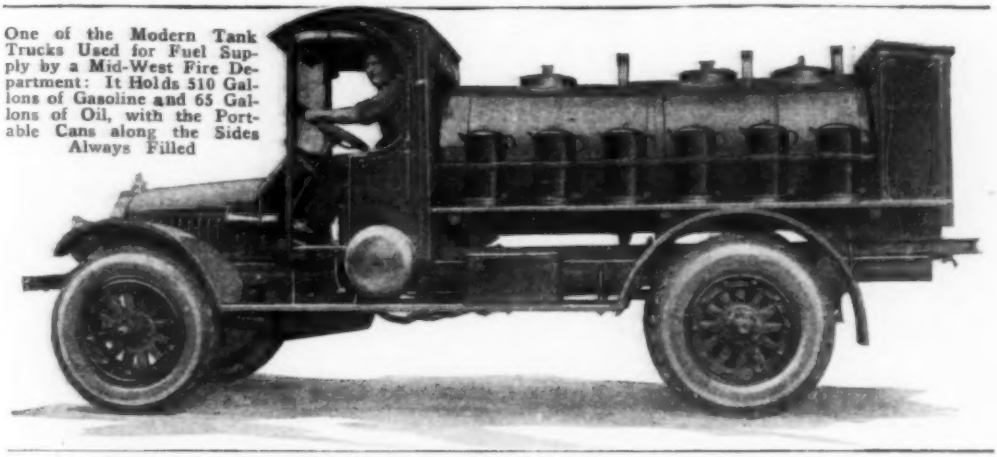
China, popularly regarded as a land where modern labor-saving devices are taboo, is to be invaded this winter by an American houseboat loaded with a complete demonstrating outfit of electrical household appliances. Because of the absence of local generating plants in the regions to be visited, a number of farm-lighting sets will be included in the cargo. Some 5,000 miles of river and canal are to be traversed by the demonstrating party, through territory where the use of electric current for home conveniences is still unknown. Though conducted by a manufacturer, the purpose of the campaign is educational, and it is thought that even the poorest classes will gain by it, if their employers can be persuaded to adopt electrical methods.

FIRE ENGINES ON JOB GET FUEL FROM TANK TRUCK

Now that fire departments are motorized, and the shrill tooting of laboring engines for more coal has departed with the plunging horses, newer methods of fuel supply must keep pace with the general progress. A mid-west city



Representing Two Years of Labor. This Motorcycle Has an Appearance of Power and Comfort Usually Lacking in the Conventional Machine. A Number of Original Ideas have been Incorporated



One of the Modern Tank Trucks Used for Fuel Supply by a Mid-West Fire Department: It Holds 510 Gallons of Gasoline and 65 Gallons of Oil, with the Portable Cans along the Sides Always Filled

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has just equipped each of its important fire stations with a large, modern tank truck, holding 510 gal. of gasoline and 65 gal. of oil. Ranged along each side of the main tank are six portable gasoline cans, always ready for emergency call, and frequently needed, for the average consumption during a "4-11" fire is 100 gal. of gasoline, and 10 qt. of oil.

COMBINATION INSTRUMENT MAKES TESTS QUICKLY

A compact, easily portable cabinet containing the necessary instruments with which to make a variety of automotive electrical tests has been constructed by a western electrician. Dry cells or storage batteries may be used as current sources to test and adjust vibrating and nonvibrating spark coils, spark plugs, and double and single-contact bulbs of different voltage ratings.

PET BIRDS TAUGHT TO SING BY WHISTLING AIR TANK

Taking advantage of the imitative faculty of song birds, a simple mechanism has now been contrived that actually teaches canaries and other pet warblers how to increase their singing repertoire. A partly water-filled cylindrical metal tank, in which a slightly smaller inverted tank slides up and down, provides enough air pressure for blowing a series of whistles of different tone, with which the operator can imitate a bird song, or even play a simple air, as an example to the captive performers.

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STATE OF ILLINOIS NOW HAS MODEL PENITENTIARY

Illinois' big, new, strictly modern state penitentiary, put under construction in 1913 and described in Popular Mechanics Magazine for April of that year, is now finished. Inclosing 64 acres of land within its concrete wall, the new prison contains eight circular cell houses, each with 240 light and sanitary cells in four tiers, all visible from a central watch tower, and the whole roofed with skylights. Cell doors and lights may be operated by switches in the tower. The wall, 24 in. thick at the base and 14 in. at the top, is 33½ ft. high above ground and extends 10 ft. below. The site of this model institution is at Statesville, just northwest of Joliet on the west bank of the Desplaines River, and in the center of the state farm

All the Cells of Each Circular Cell House Are Visible from the Watch Tower in the Center, as Indicated Above. The Officer on Duty Controls the Cell Doors and Lights by Means of Switches, and a Skylight Covers the Whole Circle

Below: Convicts are Seen at Work, Building the Big Concrete Wall, 6,500 Feet Long, 33½ Feet High above Ground and Extending 10 Feet below It, 24 Inches Thick at the Base, and 14 Inches at the Top. It Incloses an Area of 64 Acres

PHOTOS COPYRIGHT.

View of One of the Circular Cell Houses of the New Illinois Penitentiary, in the Center of the State Farm at Statesville: There Are Four Tiers of Cells and a Glass Roof. In the Background the Shops may be Seen

Left: An Interior View of One of the Modern-Type Sanitary Cells, with Its Steel-Barred Casement, Steam Radiator, Fresh-Air Inlet, Toilet, and Lavatory; the Walls are Enameled, and All Corners are Rounded

Inside the Watch Tower: The Big Switches Enable the Officer on Duty to Operate the Doors of All the Cells in the House, Which Are in Plain View

Also Controlled from within the Tower Are the Lighting Switches for All the Cells. In the Daytime the Big Skylight Roof Gives Ample Illumination

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of 2,200 acres. Convicts themselves did most of the work on the big penal stronghold, which includes workshops and other adjuncts as modern in their appointments as the cell houses.

CAPABLE SLOT MACHINE SELLS NEWSPAPERS

A Seattle newspaper has set up slot machines for selling its publication. A window in front displays the paper, and

A Slot Machine That Sells Newspapers and Makes Change without Error: It Declines to Accept Slugs and Washers in Payment

all that is necessary to get a copy is to drop a nickel, dime, or two pennies, into the slot and pull a hand lever. The device rejects washers and slugs, and returns the proper change without error. If the purchaser makes a mistake, the coin is returned by reversing the lever. By a simple adjustment, the price of the paper, from 1 to 10 cents, can be changed, and the correct change will be returned. The box holds 150 papers and when all have been sold the slot is automatically closed.

GALLSTONES OF CATTLE SOLD BY POUND AT HIGH PRICES

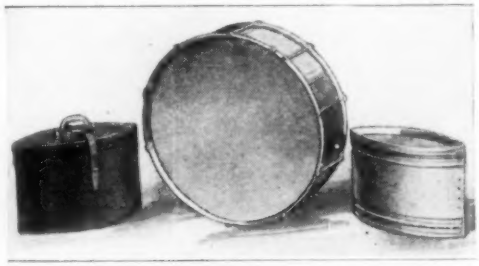
Slaughter houses are the source of many curious by-products, and among the strangest, with the highest value, are the gallstones of cattle. This queer commodity, in a newly developed market, has sold at from $160 to as high as $225 a pound, much of it for export to Japan. Gallstones contain a large amount of cholesterin, a fatty crystalline alcohol useful in biological laboratories, which probably accounts for much of the demand, though some may be used as amulets, or for barbaric medicines.

HUGE BAKE OVENS WILL MAKE MILLIONS OF BISCUITS

Baking ovens of enormous size and capacity are being installed in a new $1,000,000 addition to the bakery department of a Massachusetts food manufacturer. They are built on the rotating-wheel principle, and will occupy a space 20 ft. square and 40 ft. high. The output of each oven is to be 2,400,000 biscuits a day. It requires 85,000 brick to build one oven, and the total weight of each will be about 800,000 lb. when completed.

LIGHTWEIGHT FOLDING DRUM PACKS IN SMALL SPACE

The trap drummer is, at last, to be relieved of the burden of a full-size bass drum while on his travels. A Pennsylvania drum manufacturer has evolved the collapsible bass drum which may be packed in two small carriers, one of which may be an ordinary suitcase, the other being of a special shape. The drum, when assembled, is 28 in. in diameter and weighs only 12½ lb. The manufacturers claim that, despite the light weight and small size, the instrument gives forth tones of quite satisfactory value and volume. To dismantle the drum, the tension wingnuts are loosened and the side



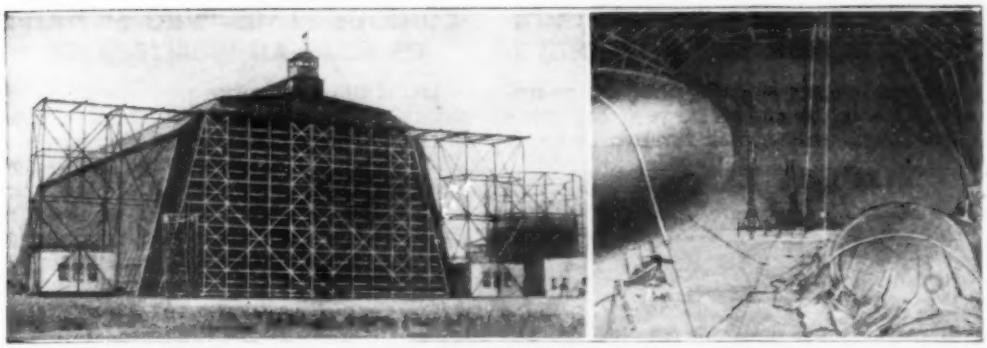
Collapsible Drum Assembled and Folded: The Heads are Rolled Up and, Together with the Small Parts, Packed inside the Partly Collapsed Frame. At the Left, Is a Special Carrying Case

rods removed. This allows the drum to collapse. The times given as required to dismantle and assemble are one and three minutes, respectively.

NAVY BUILDS HUGE SHED TO HOUSE DIRIGIBLES

A huge shed for the housing of naval dirigibles at a Pacific-coast air station has been completed. The dimensions of the structure can be imagined when it is known that it was built to protect four of the big gas bags.

A feature of the hangar is the sliding



The New Dirigible Hangar of the San Diego Naval Air Station will Accommodate Four of the Huge Gas Bags. Left: The Sliding Doors Which are Operated Independently of Each Other by Separate Electric Motors. Right: An Interior View of the Structure That Gives Some Idea of Its Vast Proportions

doors, by means of which the entire end of the building is cleared for the entrance or exit of an airship. These doors are divided in half, just as the familiar sliding barn door. Each half is mounted on a steel framework which runs on an overhead track extending beyond the sides of the building. The doors are operated independently of each other by electric motors.

SHOP APPRENTICES HAVE HOME ESTABLISHED BY EMPLOYER

Reviving, for new reasons, the ancient system that gave the shop apprentice a home with his employer, a large eastern machinery manufacturer has established 27 apprentice employes in a home-like two-story house. Sleeping rooms accommodate one, two, or three occupants; shower baths, laundry, and a housekeeper are provided, and the living room contains all reasonable comforts. The plan is expected to promote "shop talk" and increase the ambition of young workers.

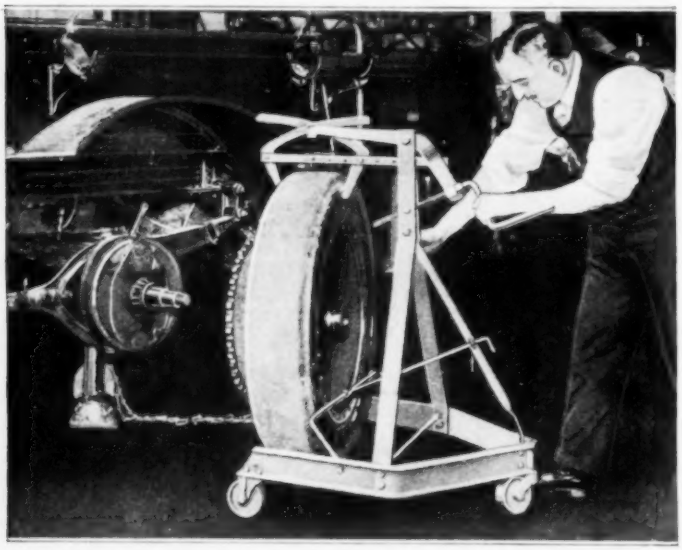
VOLUNTEERS BUILD 50-MILE ROAD ACROSS DESERT

The 50-mile expanse of the Snake River Desert between the towns of Blackfoot and Arco, Idaho, has been traversed, heretofore, only by an old, overgrown Indian trail. Travel between the two towns has, therefore, been a matter of making a long detour, or of using this threadlike trail, at the risk of life, limb, and automobile. Despite the importunities of both communities neither state nor county would appropriate money for improvement of the trail. So, recently, volunteers were called for, and 100 men, many of them from business and the professions, responded in each town. Starting at each end of the long job, the amateur roadmaking parties worked toward each other, and after four days' toil with shovels, plows, and graders, were able to contemplate a finished road. A union jubilee followed. A layer of concrete was applied subsequently, giving permanency to the improvement.

At the Left is Assembled One of the Two Parties of Volunteer Roadmakers Who Built the 50-Mile Road over the Snake River Desert, in Southeastern Idaho. The Nature of the Country is Suggested at the Right. Sagebrush, Rocks, and Fallen Timber Usually had to be Removed Before Grading could be Undertaken

MOVABLE CRANE FOR GARAGE LIFTS MOTOR-TRUCK WHEELS

Garagemen are learning that the operation of lifting on and off large motor-truck wheels, ordinarily a task for two or three men, can be accomplished more quickly by one, if into his hands is put an apparatus now made for the purpose. It consists of a midget crane which is mounted on three rollers for easy movement across the floor of the garage. From the arm of the crane hang the two grabhooks which seize the rim of the wheel. These are operated by means of a hand crank. A second control at the base checks the tendency of the wheel to spin when hanging free.



This Little Crane Makes Easy the Task of Lifting On and Off the Wheels of the Larger Motor Trucks. The Rim of the Wheel is Seized by Means of the Two Grabhooks at the Top of the Apparatus

RECORDING HYGROMETER AS A DETECTIVE

Hygrometers are instruments for determining the relative humidity of the air. In some forms they are arranged so that a record of the humidity is obtained by a pen drawing an ink line on a paper chart, which is mounted on a drum driven by clockwork.

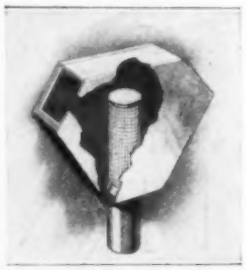
Such an instrument was mounted in a government basement room with a master clock. It was found that the presence of a person in the room for only a few seconds changed the relative humidity of the air to such a degree, that it was disclosed in the curve drawn by the instrument.

CURIOUS STAGE "PROPS" MADE OF GERMAN SUBSTITUTES

Artful substitution of new materials for old ones that cannot be obtained, a trick Germany learned during the war, has now extended to the stage properties used in that country, with some queer results. Shapes made of thin paper and blown up with air are adapted to all sorts of settings, from rocks and trees to pianos, and serve their purpose so long as no forgetful actor leans against them. "Props" of this kind have at least the advantage of compactness and light weight. Luxurious-looking rugs and hangings are made by a new and economical process of printing on fabric. One attraction has a property tree, so made, of paper and wire, that it can be adjusted to any height, from a bush up. In another case, a real field of waving grain is transported to the stage by gluing straws to folding sections of flat base, the whole being fireproofed. Some interesting new cloud effects are produced, presumably by the optical projection of chemical-vapor images.

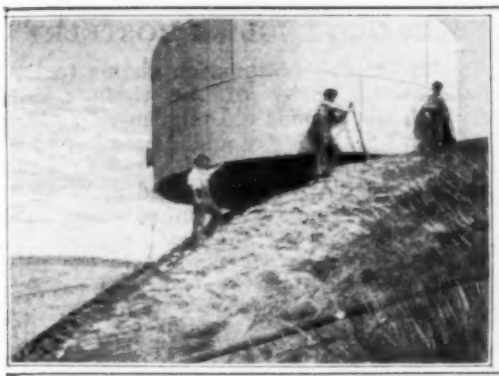
FLAT GASOLINE FUNNEL EASILY STOWED AWAY

A gasoline funnel for use on motorboats and automobiles, that has been put on the market in England, is made flat, so that it can be stowed in a locker or tool box. Instead of the opening being at the top, as in the usual funnel, it is placed at an angle on one side. A special wire-gauze strainer is claimed to be nonchoking, while water and other foreign matter fall to the bottom free of the strainer. Owing to its closed top, such a funnel is a distinct advantage in rough-weather motorboating, as spray is not likely to enter it.



COURTESY OF THE MOTOR BOAT, LONDON

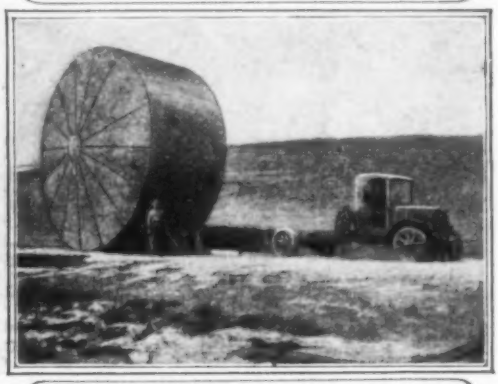
ROLL AND FLOAT BIG TANKS TWENTY-FIVE MILES



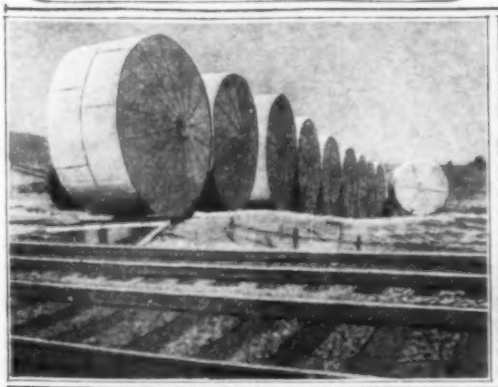
Ten Huge Steel Tanks, No Longer Needed for Explosive Manufacture, were Recently Moved 25 Miles to an Oil Station in California. The First Step Was to Place Iron-Pipe Rollers under Each Tank

The Big Containers, Each Nearly 23 Feet in Diameter and 10 Feet High, with a Weight of 16,000 Pounds, were Moved on Their Four-Inch Rollers to the Brink of an Incline, and Tilted Over onto It

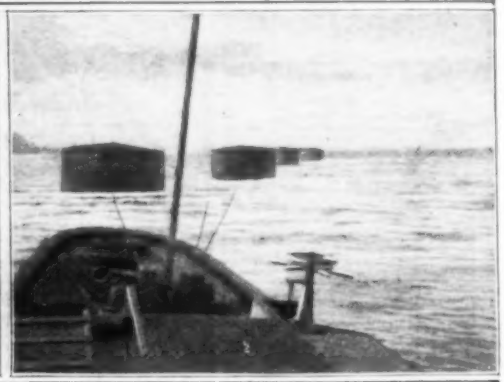
It Was Then an Easy Matter, with a Powerful Motor Truck and a Steel Cable, Attached to the Upper Edge of Each Tank, to Tip Them Up, One by One, onto Their Round Sides, Ready for the Next Operation



With a Rolling Hitch of the Cable around the Tank, and a Straight Pull of the Truck, the Ground was Covered at a Good Speed, Little Grading Being Necessary Even on a Half-Mile of Very Rough Going



All the Tanks had to Cross a Busy Railroad to Get to the Water, and They were All Lined Up to Await the Nighttime, When Traffic Became Less Brisk, and the Crossing was Made without Trouble



Finally All Ten of the Great Steel Shells were Rolled into the Bay and Tied Together in One Long String. A 110-Horsepower Motorboat Then Towed Them against Wind and Tide to Their Destination

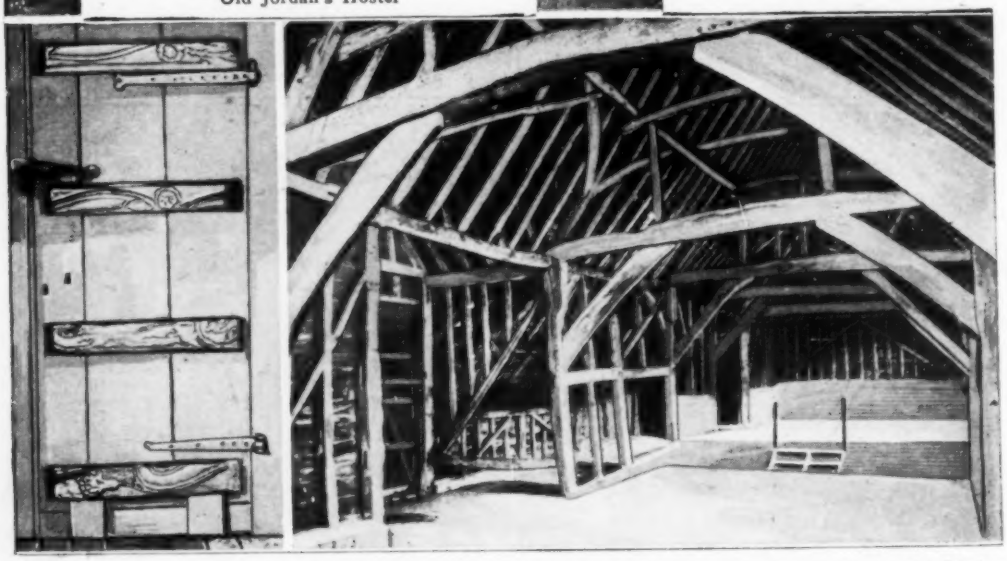
ELECTRICALLY DRIED FISH KEEPS FRESH FOR YEARS

Electrical dehydrating plants for fish are promised as a result of recent experiments in England, which demonstrate that it is possible, with the aid of heated air, to accomplish in a brief time results that now require many days of air curing. Deprived of every trace of moisture, the fish meat may be kept for years, and then restored to its original freshness by soaking for three days in water. The dried flesh also may be ground into a fine flour of high food value. The process has been patented in all countries.

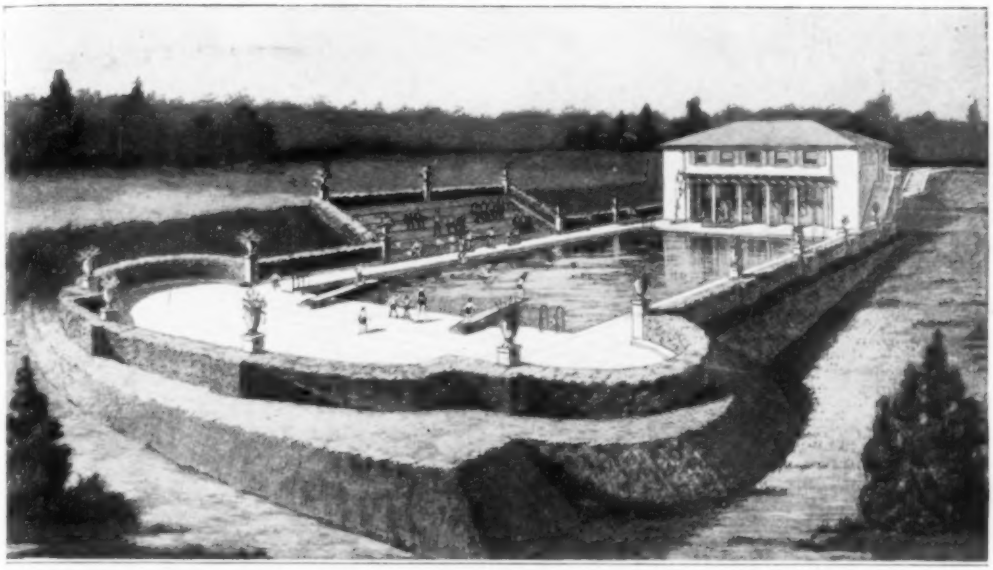
RELICS OF "MAYFLOWER" FOUND IN OLD ENGLISH HOSTELRY

An English antiquarian claims to have discovered many of the timbers from which the famous old pilgrim ship "Mayflower" was constructed. These have been used in the building of a tavern called Old Jordan's Hostel, located at Chalfont St. Giles, Buckinghamshire, Eng. The cleats of one of the tavern doors are carved with the devices and in the manner peculiar to marine decorative schemes in vogue at the time the "Mayflower" was built. The heavy timbers forming the framework of the barn are also thought to have been taken from the famous old ship. The voyage and landing of the "Mayflower" at Plymouth Rock, in 1620, constitute one of the picturesque episodes of American history, as the passengers on this voyage were the original Pilgrim Fathers who settled Massachusetts. Inasmuch as the present year is the tercentenary of their landing the discovery of the ancient timbe's has been of particular interest. The massive old timbers are in an excellent state of preservation and capable of giving good service for many years.

Famous Old English Hostelry Partly Constructed from Timbers Once Used in the Old Pilgrim Ship "Mayflower": It is Known as Old Jordan's Hostel



Interior of the Stables Showing the Old Ship's Beams: The Carved Door Cleats Are Peculiar to the Marine Decorative Style Prevailing at the Time the "Mayflower" was Built. The Timbers Are in an Excellent State of Preservation



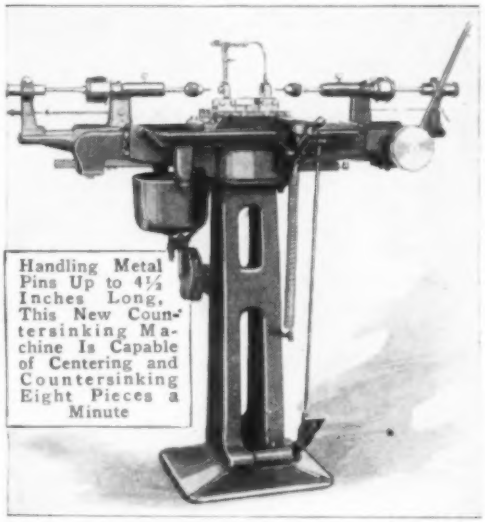
The Design for the First of Four Public Swimming Pools to be Built in Pittsburgh's Playgrounds: The Pool, 50 by 100 Feet, Has a 300-Seat Concrete Grand Stand, and a Thoroughly Equipped Bathhouse

UNUSUAL DETAILS IN DESIGN OF CITY SWIMMING POOL

Of four public swimming pools soon to be built by the city of Pittsburgh in its playgrounds, the plans for one have recently been completed, and reveal a number of interesting details. The basin, of solid concrete, bordered by concrete walks, is 100 by 50 ft., and graded from 2½ to 8½ ft. deep. A water-level gutter running around the edge of the pool, for drain-off surface dirt, will serve a second purpose in offering a handhold to emerging or resting swimmers. At one side 300 spectators may be seated on a concrete grand stand, and a hedge will surround both walk and stand. At one end is to be a two-story building, 30 by 50 ft., finished in stucco with an asbestos-tile roof. In this will be the office, check room, towel room, dressing rooms, showers, and toilet facilities. It is estimated that $32,000 will cover the cost of the entire establishment.

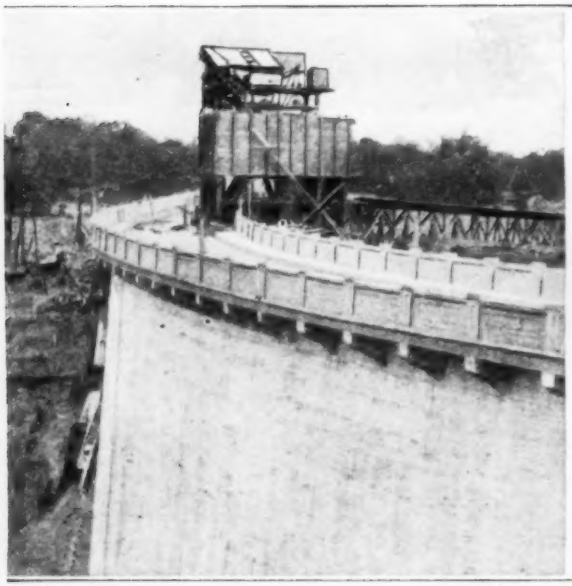
HORIZONTAL DOUBLE-SPINDLE COUNTERSINKING MACHINE

Especially designed for countersinking both ends of metal pins at a single operation, a new drilling machine has made its appearance. The drill spindles are mounted horizontally and driven independently of each other. The feed is operated manually through a lever. Cutting lubricant is supplied by a rotary pump only when the actual countersinking is being done. The work-holding fixture is adjustable for various lengths and diameters within its capacity. The machine can handle pieces from 1 15/16 in. to 4½ in. long.



Handling Metal Pins Up to 4½ Inches Long, This New Countersinking Machine Is Capable of Centering and Countersinking Eight Pieces a Minute

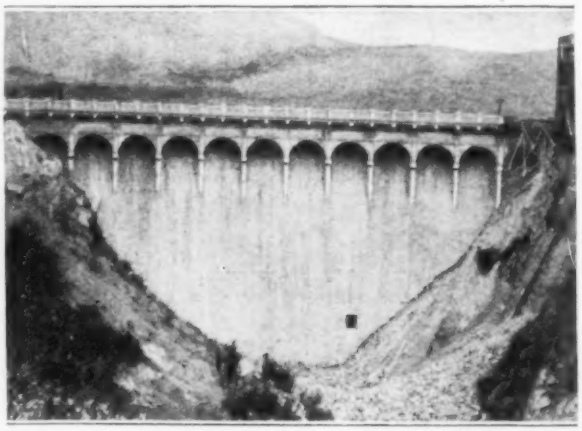
¶Restoration of the northern and eastern railway systems of France, now completed, necessitated the reconstruction of 3,479 miles of single track, 1,802 miles of double track, 1,510 bridges, 590 buildings and signal stations, and 12 tunnels. The service given before the war has been resumed.



The View, at the Left, of the Curving Upper Face of the Dam, Shows the Long Bend of the Concrete Road That Tops It, the Walks along Its Border, and the Ornamental but Massive Walls That Guard Its Sides

ROADWAY CROSSES TOP OF REMARKABLE DAM

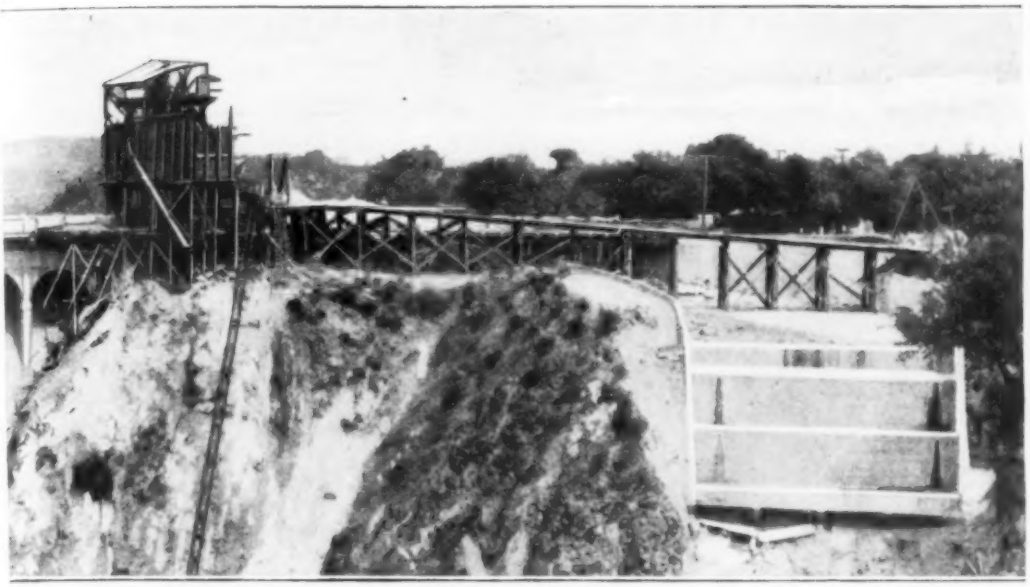
INGENIOUS construction methods, new ideas in design, and a double purpose, are features that make unusually interesting the completion of the Devil's Gate Dam, near Pasadena, Calif. The most striking innovation of the structure, plans for which were revealed in this magazine just a year ago, is perhaps the 20-ft. concrete auto road that runs across the 310-ft. top of the big dam. Designed to suit this unusual arrangement, the overflow spillway consists of a series of arches under the road, through which the escaping waters rush down the long concrete incline without endangering the road itself. As an additional factor of safety, a second overflow outlet is provided, which, instead of being a part of the dam, goes around it. The outlet tunnel, too, is entirely separate from the dam structure.



The Downstream Side of the Completed Dam, with the Walled Auto Road on Top, the Overflow Arches Beneath, and the Long Spillway

With all the available stones in the bed of the stream, and the rock crusher located at the top, 130 ft. above, resort was made to an interesting device in building the dam. An almost perpendicular track was laid, with straight tree trunks for rails, and up this curious railroad the rock was pulled in an iron bucket, saving three miles of hauling. In an even more interesting way, the mixed concrete for the outlet tunnel was lowered by means of a chute, nearly 300 ft. long, slung on a cable across a narrow chasm. Including the tunnel, which is 13 by 13 ft., and 500 ft. long, 30,000 cu. yd. of concrete was used in the big dam.

¶ Sheet lead may be reinforced with iron in the same way as concrete, by a recently patented process. Perforated sheet iron or wire mesh is used for the reinforcement, increasing the tensile strength of the lead 100 to 200 per cent, and multiplying the elastic limit by four or five. The sheets may be joined by burning, or rolled into pipes.



The Large Panoramic View of the Dam Takes in Both Overflow Outlets, the One at the Right Entirely Separate from the Structure, the Other under the Roadway That Spans the Top of the Dam. In the Center Is the Log Track up Which the Stone was Hauled

The Outlet Arches under the Roadway, for the Overflow, are Clearly Seen in This View of the Upstream Side of the Big Dam

The 300-Foot Chute, Slung on a Cable across the Cañon, down Which the Concrete was Shot from the Mixers on Top to the Tunnel

The Mouth of the Outlet Tunnel, 13 Feet Wide, 13 Feet High, and 500 Feet Long, Wholly Separate in Construction from the Dam Itself

RICHEST OIL FIELD BUT FEW MONTHS AGO A PASTURE

What was but a few months ago a cattle rancher's grazing ground is today one of the world's richest oil fields. The Desdemona field, which includes some of the largest producers in the Burkburnett territory of Oklahoma, prior to its development as an oil-producing region was owned by cattle ranchers and cotton growers. Today hundreds of oil rigs and lakes of oil cover the scene and no blade of grass is to be found.

Hundreds of Oil Rigs and Small Lakes of Oil Now Cover the Face of What Was but a Few Months Ago a Peaceful Neighborhood of Cattle Ranches and Cotton Plantations

HYDROCYANIC-GAS WARFARE ON VERMIN SUCCESSFUL

A company has been organized to exploit the process of exterminating vermin with the deadly fumes of hydrocyanic gas. All openings in the room to be treated are sealed by the operator, who then dons a mask and generates the gas by adding an acid to any one of several cyanides. When he has retired, the door is closed and sealed, and the gas is allowed to fill the room. After remaining sealed for several hours the room is opened and ventilated.

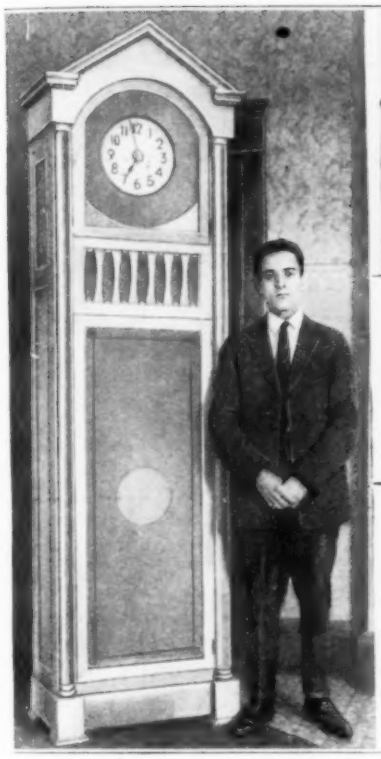
NEW-TYPE CONCRETE SHIP HAS UNUSUALLY THIN WALLS

A reinforced-concrete vessel of 3,300 tons' displacement, with walls only 3½ in. thick, has just been built in a Danish shipyard according to a new design. Despite their thinness, the walls, made with concrete of one part cement and two or two and one-half parts conglomerates, remain completely tight under a 20-ft. head of water. The ship is 231 ft. long, 36½ ft. in the beam, and has 17½ ft. draft under load, carrying 1,800 tons. The hull weighs 1,120 tons complete, with 250 tons of steel reinforcing. A turret deck and a double bottom are other features, and bulkheads and doors of reinforced concrete divide the hull into five water-tight compartments. It has a 500-hp. triple-expansion engine, makes 9¾ miles an hour, and is equipped with modern loading and unloading machinery.

LOBSTER OF UNUSUAL SIZE IS MOUNTED IN STATE

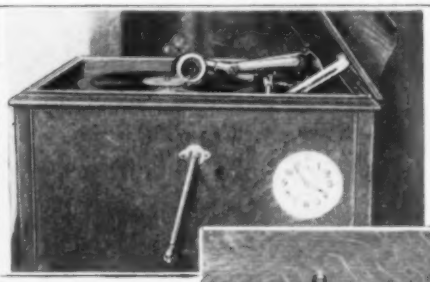
Mounted in state in a glass-sided case, as befits a monarch of his tribe, a lobster of enormous size now adorns the office wall of a taxidermist of Grand Manan Island, off the New Brunswick coast. The huge shellfish scaled, when caught, the unusual weight of 28 lb., making it as much of a trophy, in that quaint fishing community, as is a 50-lb. muskellunge or an 8-lb. black bass in regions where fishing is a sport and not a matter of daily and arduous labor.

A 28-Pound Lobster from the New Brunswick Coast, Whose Prodigious Size Warranted the Tribute of a Glass-Cased Mounting



This Clock Is the Product of a Philadelphia Father and Son. It Speaks or Strikes the Hours as Desired and Tells the Family When to Turn Out in the Morning

C., UNDERWOOD & UNDERWOOD



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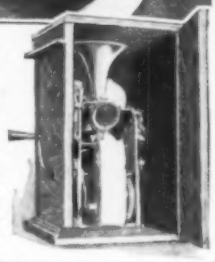
Left: The Alarm Clock Set Starts the Instrument Playing at the Desired Hour. Below: The Turntable Brake That is Released by the Clock's Alarm Mechanism

C., UNDERWOOD & UNDERWOOD



A Remarkable Phonographic Clock Which Speaks the Hours, Reproducing the Sound from Waves Recorded Longitudinally upon a Celluloid Film. Right: The Clock Opened to Show the Arrangement of the Film Reproducing Apparatus

HOROLOGICAL MASTERPIECES THAT SING AND TALK

Possibly the most remarkable of a series of clocks which deliver phonographic messages is one invented seven years ago that is operated by electricity. The sound waves are recorded on a celluloid ribbon instead of on the usual disk.

Another clock "talks" indirectly—like a spiritualistic medium—through any phonograph to which it is attached. The clock is set to release the turntable brake at the proper hour, and one can thus awaken to the strains of his favorite "tune."

The third clock is the product of a Philadelphia father and son. Ordinarily the clock strikes the hours as one would expect of a properly constituted timepiece, but by turning a handle the hours are spoken. At six in the morning the clock tells the family that "It's time to get up," while at 11:00 at night a visiting swain is startled to hear a stern voice say, "Time to go home, young man—it's 11 o'clock."

¶Adjustable magnification is a curious feature of a new European form of telescopic rifle sight.

TENT COTTAGES REPLACED BY THATCHED PALM HOUSES

The familiar tent cottage of the western summer resort is disappearing before the thatched palm house, which has a number of advantages the former does not possess. The thatch house consists of the usual tent-cottage framework, but instead of canvas, palm leaves are tacked on. The palm leaves, which are quite durable, serve

Thatched Palm Houses are Becoming Popular at West-Coast Resorts. The Palm Leaves are Tacked over the Cottage Frame, Covering Both Roof and Walls

equally well for walls and roof, and make a neater and more artistic appearance than the canvas. At the same time costs are lessened, as the palm thatch costs little or nothing compared with canvas.

SOLAR-HEATED STATIONS WARM TOURISTS

Eastern tourists who visit California during the cool months of that state's temperate winters will no longer have occasion to complain of unheated suburban electric stations. An electric system with lines connecting the principal points of southern California has begun the erection of a system of suburban stations where solar heat will be utilized for patrons' comfort during the daytime, and electric heat during the cool hours of the evening and early morning.

The New Waiting Stations on a California Electric Line Are Veritable Sun Parlors, Relying upon Solar Rays for Their Warm Interiors

The new stations are built after the fashion of spacious sun parlors, where solar heat, which is fairly reliable in that locality, is utilized to warm the interior. The roofs of the structures are made of an asphalt shingle constituted to draw the heat and radiate it within the station.

Electric heaters are fitted under the benches and are used on days when the sun does not shine, but those are rather uncommon occasions in that climate, and nature's supply of warmth is usually adequate.

LIMOUSINE LUXURIOUSLY FITTED FOR TOURING

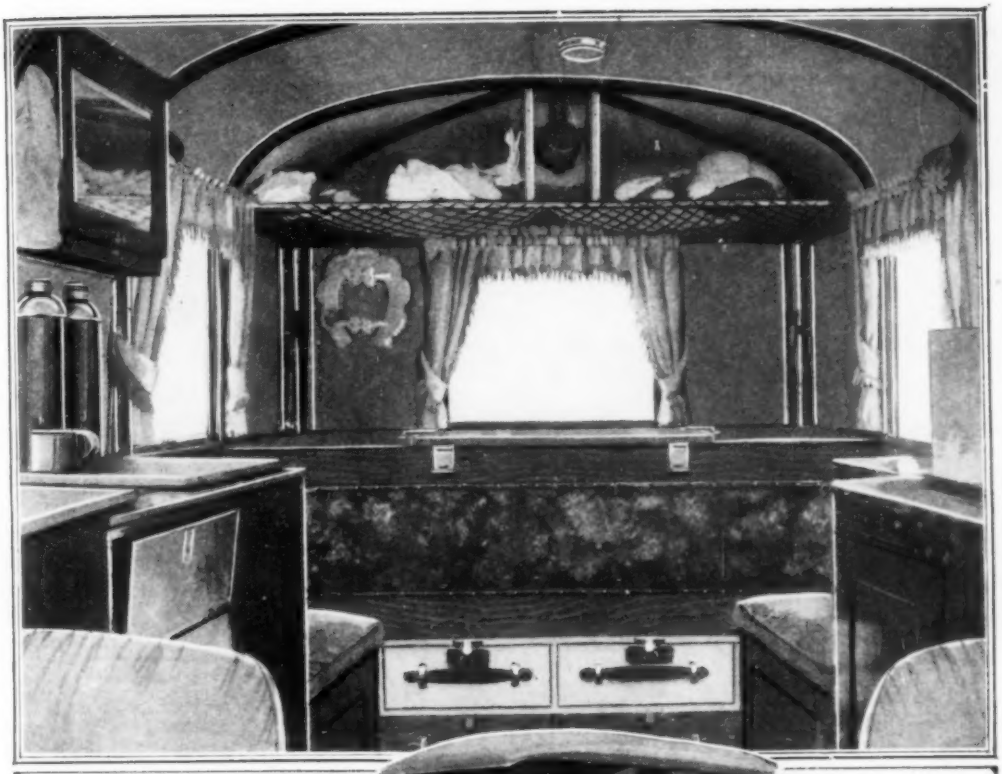
BY JOHN ANSON FORD

ONE of the most luxurious and ingenious "homes on wheels" which has yet been constructed by a motorist is that built by a Texan, who provided an eight-cylinder chassis with an inclosed body fitted with every imaginable household convenience, at a cost of $10,000. With it the owner and his family have been making extended tours of the United States. This motorized home is 10 ft. long and 6 ft. wide, and is provided with seats for four. The height inside is 5 ft. 10 in. Across the back is a folding bed measuring 5 ft. 10 in. by 4 ft., equipped with spring and mattress. Above it is a clothes and parcel rack resembling that found in a railway coach. At the rear of the two front seats is a 3 by 5-ft. aisle, with window seats at either end fitted with cushions, 2 ft. wide. A table turns down in front of these seats, making a convenient eating place for four.

All the comforts of a kitchen and bath are also provided, no expense having been spared to design features that would adapt themselves to the limited space of the car's interior. These include a refrigerator, a lavatory, a cabinet equipped with thermos bottles, hot and cold water from pressure tanks, a three-burner gas stove, a two-burner oven, cupboards built against the wall, and also numerous shelves. Removal of the top of the driver's seat reveals the toilet, which can be shut off from view by curtains.

Other conveniences which bespeak the luxury in which these motorists ride are a cigar humidor within easy reach of the passengers when seated, a small cabinet containing a cuspidor, shower-bath attachment to the water tanks, electric cigar lighter, and an electric fan. Other features suggestive in part of the sea and in part of aerial transportation are a compass, an altitude meter of special value in mountainous regions, a gradometer, a thermometer, a perpetual calendar, and a ship's barometer. Mirrors above the front seats give the driver an excellent view of the road at the rear through the large back window.

The body of this little palace is of steel, with the exception of the roof, which is of canvas. The car has been driven over 10,000 miles and carried a baby less than one year old without discomfort. It was built by the owner for use in his search for health, and the diversion, exercise, and enjoyment it afforded is said to have cured him of his malady.

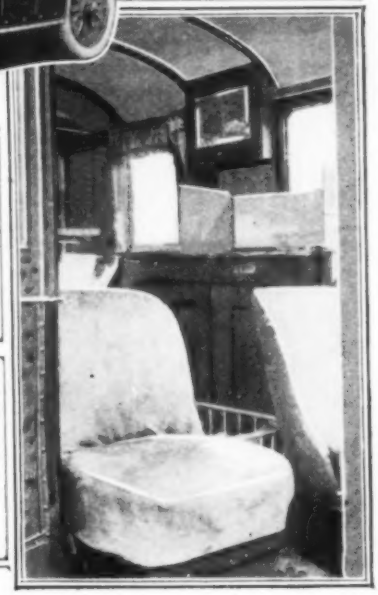


Interior View, Looking toward the Rear of the Touring Limousine: Across the Back Is the Folding Bed, Four Feet Wide, That Becomes a Window Seat in the Daytime, and above It Is a Commodious Clothes Rack. At the Left Is the Combination Stove and Kitchen Cabinet, and at the Right One Corner of the Refrigerator

Outwardly, the Limousine with the Unusual Interior does Not Differ Greatly from Any Other, Except for Its Doors. The Special Body is Made of Steel, and Is Ten Feet Long and Six Feet Wide

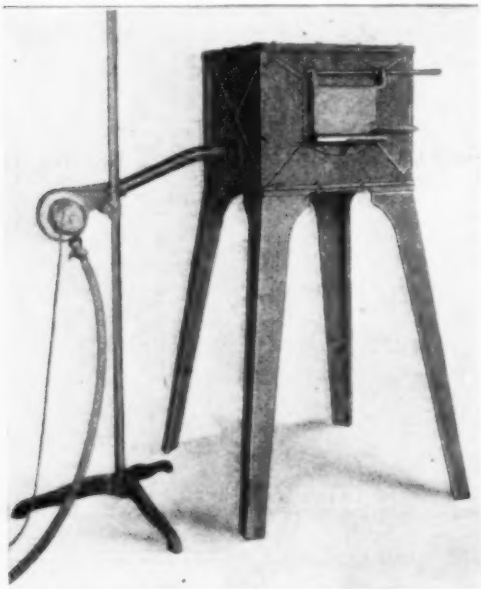
Looking through the Left-Hand Door, the Two Forward Seats are Seen, and behind the Farther One Is the Cabinet-Stove. Washstand and Toilet Facilities Are behind and under the Seats

A Peek through the Right-Hand Door Gives a Glimpse of the Refrigerator, Back of the Driving Seat, and Just Visible Below Is a Corner of the Crib in Which a One-Year-Old Baby Travels



COMBINED TORCH AND FURNACE IN SEPARATE UNITS

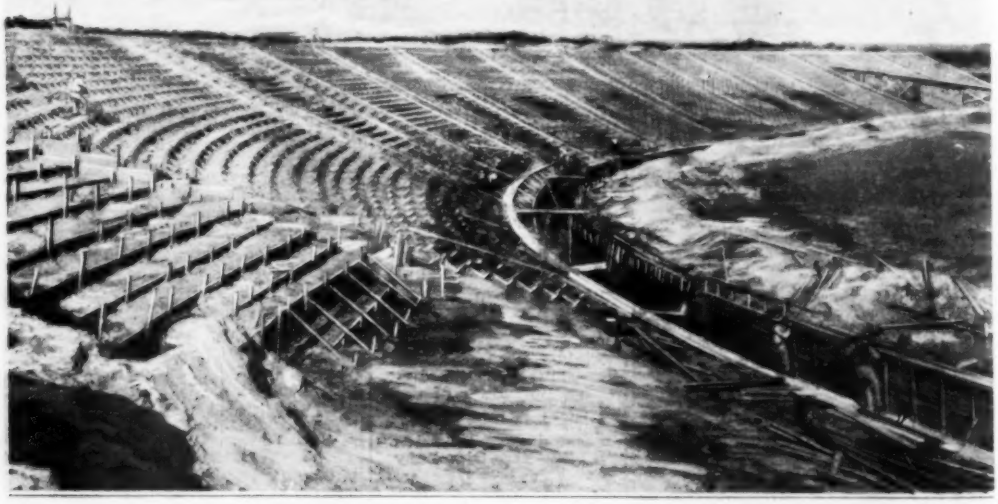
A blowtorch which operates on natural or artificial gas and air furnished by a self-contained electrically driven blower is capable of producing a maximum temperature of 2,500° F. For use in connection with this torch, a special furnace has been placed on the market. Openings are provided so that the furnace can be fired from either side. The cast-iron box is lined with special firebrick and insulated with asbestos. There is a 6-in. circular opening in the top for melting soft metals; this opening is closed by a firebrick plug when the furnace is to be used for tool hardening.



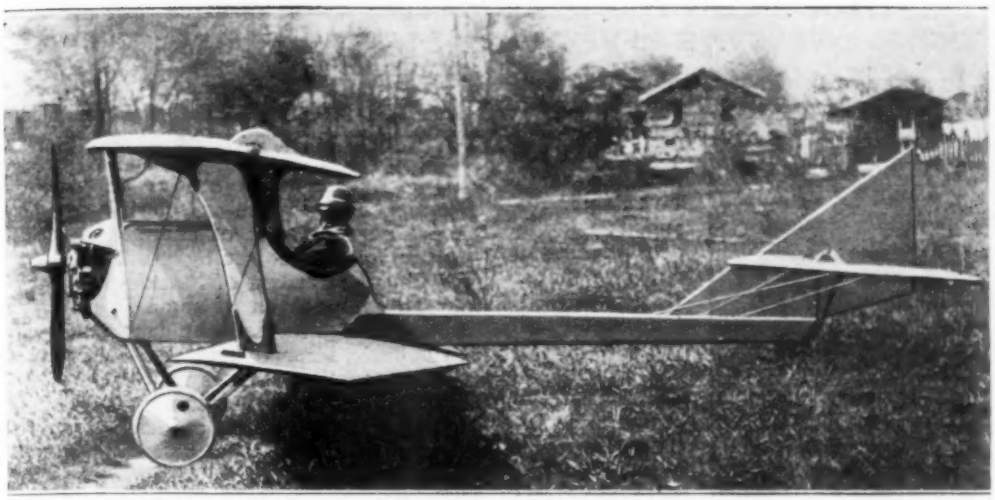
A Portable Gas-Electric Blowtorch That Is Capable of Producing a Maximum Temperature of 2,500° F., and a Specially Built Furnace for Use with It

BUILD HUGE WESTERN STADIUM BY ODD HYDRAULIC SYSTEM

Using a hydraulic mining system and a battery of pumps is a queer way to build a stadium, but it is one now being employed with success at Seattle, Wash. The big amphitheater, 487 by 256 ft. inside, and seating 60,000 persons, is being constructed on a stretch of level ground. Where the seats are to be, wood forms have been erected. Using a giant nozzle and a high-pressure stream of water, the soft earth in the central field is washed up and converted into thin mud. This semifluid material is then pumped directly into the wood forms, and allowed to settle as the water drains out. So firmly is the earth packed by this process, when dried out, that a concrete surface for the seats can be poured as soon as the required amount of dirt has been transferred, and the structure finished in short order. The job is to cost $82,000, and some 127,000 cu. yd. of dirt will be moved.



View of One Side of the Big New Stadium, Built with the Aid of Pumps: The Mud Washed Up from the Field is Pumped into the Wooden Seat Forms, Allowed to Settle, and Then is Covered with Concrete



CONVENIENCES FOR PRIVATE OWNER MARK NEW SPORTING PLANE

DESIGNING airplanes has become so matter-of-fact a business that a new one-man sporting model, now offered at a moderate price, may be housed in a small shed, or barn, by taking 10 minutes to remove the wings, and in the field it may be converted into a tent. The little biplane is only 19 ft. long, with a 24-ft. spread, and weighs but 450 lb. empty. It takes the air after a 120-ft. run on field or road, climbs 780 ft. a minute, flies from 35 to 65 miles an hour, and may be landed very slowly, with the landing gear in full sight of the pilot. The two-cylinder, air-cooled, 20-hp. motor starts from the seat, which is low and easily entered. The wings and fuselage are of unusual form, but have been thoroughly tested and found efficient. The cost of operation compares with that of a small auto.

HIGH-VOLTAGE TRANSMISSION FOR JAPAN'S NEW PLANTS

Hydroelectric development on a large scale is now receiving attention in Japan, where it is planned ultimately to transmit 200,000 kw. over some 400 miles of single steel-tower line. Between Seto and Osaka a line is being built to carry 30,000 kw. at the high pressure of 160,000 volts, on the 60-cycle three-phase system, with the neutral grounded through resistance. Plants of 19,000 and 9,000 kw. are under construction at Seto and Mosegawa.

X-RAY OF HAND IS NEWEST RECORD OF CRIMINALS

Under the enthusiastic guidance of a physician, who originated the system, the police of a large southern city are studying X-ray photographs of the hands of criminals, and already have more than 5,000 prints. Because of certain unalterable characteristics peculiar to the bones of each hand, particularly as to the "mushrooming" of the finger-tip bones, it is asserted that the X-ray method is more reliable, as a means of positive identification, than the finger-print system now in vogue.

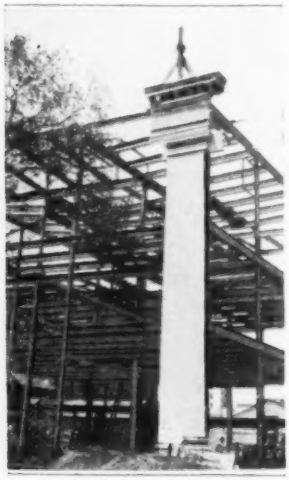
MODIFIED LEVER JACK MADE FOR USE OF MOTORISTS

A quick-acting jack of rather original design is now offered to the motorist and garageman. It consists of a long lever which is pushed about on two steel wheels at its fulcrum end. Near these wheels is a short upright member, topped by a cradle for the axle. The tendency of a coil spring to elevate this member is checked by a steel pawl. To use the jack, the motorist shoves the wheels under the axle, holding the lever at about 45° to horizontal. A pull on a chain then retracts the pawl, and allows the upright member to jump upward, bringing the cradle against the axle. The motorist now rests his weight upon the high end of the lever. As the lever approaches horizontal, the wheels act as a sliding fulcrum, and the axle rises.

The Complete Jack is Seen at the Right. At the Left Is a Cut-Away View Which Shows the Coil Spring

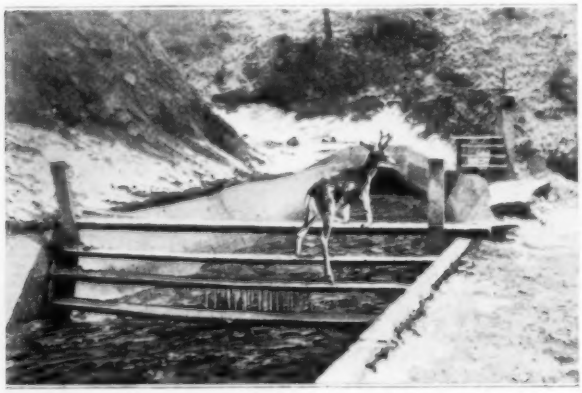
ARCHITECT BUILDS LIFE-SIZE MODEL TO PROVE HE'S RIGHT

In order to convince the doubtful owners of a large office building under construction that the proposed façade would be to their liking, the architect erected a full-size model of a part of it. The wood and plaster model was constructed against the frame of the building and colored to imitate the stone facing to be used. Thus the owners were given an opportunity of seeing how the finished design would appear, and of making any alterations they might desire.



LADDERS HELP DEER CLIMB OUT OF POWER FLUME

Special ladders have been found necessary to help wild deer out of the flume of a hydroelectric power plant on the Pacific coast. The three-mile concrete flume has sides so steep that if a deer gets into the flume by accident, it is impossible for it to escape without some assistance. Accordingly, a series of ladders consisting of wide planks arranged as steps were installed at intervals along the flume. Since then the deer are able to get out without the aid of the powerhouse operators.



In Order to Help Wild Deer That Accidentally Fell into the Flume of a Hydroelectric Plant, Ladders were Installed at Intervals along the Three-Mile Concrete Channel

SOFTENING POINT OF ENAMEL EXPERIMENTALLY STUDIED

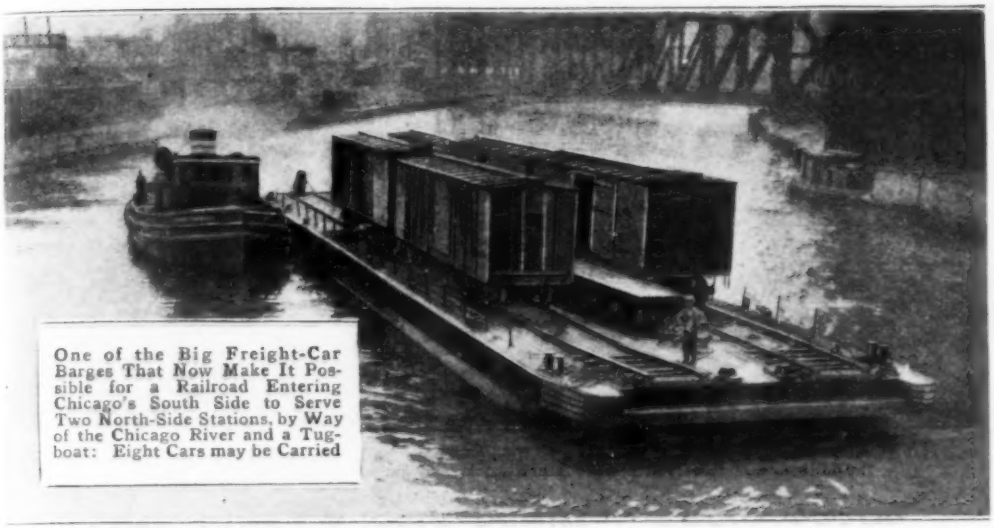
A comprehensive study of various enamels used in the metal industry, to determine the effect of changes of composition on the softening point, is being made by the Bureau of Standards. Varying the composition of some 74 different enamels has disclosed the fact that each of the basic, intermediate, and acid oxides used as constituents has its own particular effect, and no rule can be laid down for any group. Some oxides act as refractories, raising the softening point, while others, on the contrary, function as fluxes.

WASTE LYE FROM PULP MILLS IS SOURCE OF NEW FUEL

By carrying a step farther the process of recovering sulphite spirit from the waste of wood-pulp factories, by evaporation, it has been discovered that a new and valuable fuel may be produced. The process precipitates the organic contents of the lye in the form of powdered coal. Two pulp factories in Sweden are now installing equipment for the production of 6,000 to 7,000 tons each of the new fuel per year.

NEWS BULLETINS BY WIRELESS LATEST NEWSPAPER FEAT

Wireless operators, amateur and professional, on land and water, within 300 miles of a certain Michigan newspaper-publishing office, are now privileged to receive news bulletins by radiotelephone from 8 to 10 o'clock every night. The innovation was established during a recent primary election in the state, when provisions were made by the newspaper for sending the returns out through space as fast as they came in. The electric-wave program on this occasion was made particularly interesting by the inclusion of several musical numbers, not only from a phonograph but by actual connection with transmitters on a theater stage, the transfer from wire telephone to wireless being made in the newspaper office.



One of the Big Freight-Car Barges That Now Make It Possible for a Railroad Entering Chicago's South Side to Serve Two North-Side Stations, by Way of the Chicago River and a Tugboat: Eight Cars may be Carried

RAILROAD USES RIVER AS LINK BETWEEN FREIGHT STATIONS

One of the many railroads entering Chicago from the south has found an interesting and efficient way to serve shippers on the north side of the city, without requiring them to haul their goods through the congested business district. Two large and modern freight stations have been built on the north branch of the river, the road's regular freight yards lying along the south branch. Large barges, or floats, with two lines of track running from end to end, are used as the connecting link. The cars are run directly onto the barges, towed by tugs through the two or three miles of river, and pulled by local engines from the floats to the freight stations, or onto wagon tracks.

SWINGING PILLAR OF GRANITE DISCOVERED BY HUNTERS

"Old Moses," as it has been dubbed, is a remarkable pillar of granite that sways from the perpendicular in the breeze. While this latest of natural wonders, standing on the side of the Green Mountain, about 20 miles north of Cañon City, Colo., has not been altogether unknown, it has but recently been photographed. The column is about 100 ft. high. Its base is somewhat smaller than the top, and rests, entirely free from the surrounding earth, in a small hollow about 3 ft. deep. The swaying of the monolith is plainly perceptible, and the swing of the top has been estimated at a foot or more. The contour of the rock, suggesting, as it does, a comedy face, is doubtless the reason for the title that has been bestowed upon it.

One of Nature's Little-Known Wonders Is a 100-Foot Column of Granite, in Colorado, That Sways with the Wind. The Movement Is Plainly Perceptible and Sometimes Amounts to More than a Foot at the Top

General View of an Asphalt Quarry in Southern Kentucky, Where the Black, Solid Bitumen, Cropping Out from the Hillsides, is Removed like So Much Rock, and Pulverized into Paving Material

SHEET-ASPHALT MINES SUPPLY PAVEMENTS

BY JAMES C. KELLY

QUARRYING asphalt like rock and mining it like coal may seem a bit unorthodox to the city man, yet those are the methods used in the asphalt deposits of southwestern Kentucky today.

It is regular asphalt they are digging out of the Kentucky hills—a mixture of sand and bitumen like that used for ordinary sheet-asphalt pavements. The principal difference is in the making—one is mixed by nature, the other by man.

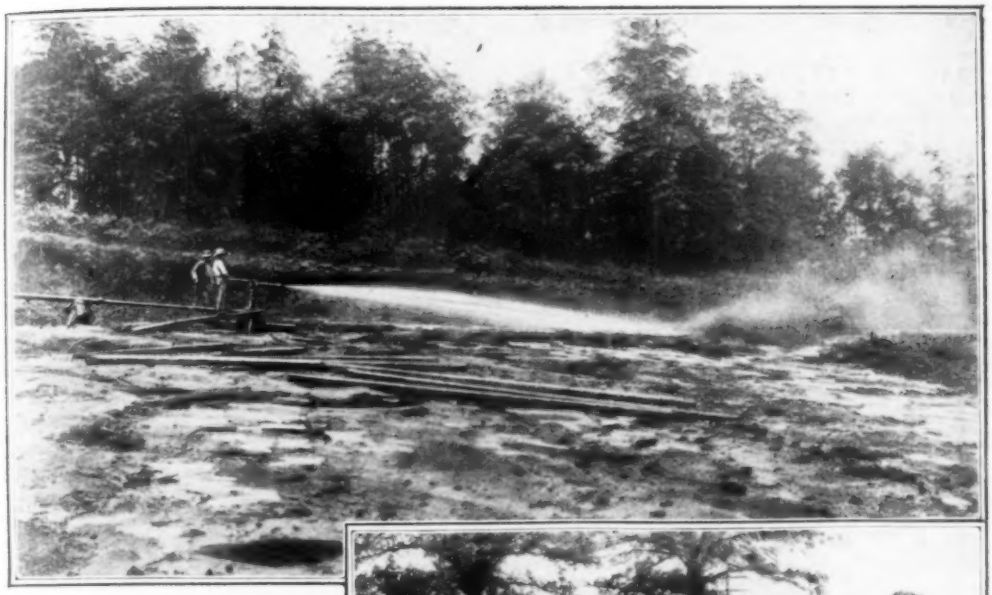
No one has estimated the quantity of natural paving material to be found in these great asphalt beds. Much of it, of course, lies so far underground and is so difficult to transport that it will never be removed from the hills. However, veins of asphalt more easy of access have been worked for the last two years without any appreciable decrease in the quantity.

Natural asphalt is a rock formation, which lies in thick veins or seams, like coal. Years before the true character of the material was known, the natives called the asphalt beds "black rock." Geologists say that the asphalt beds were once a great deposit of oil-bearing sand. Gradually the streams cut through the hills and allowed the lighter oils to drain off or evaporate. This left a black, sticky residue, known to road men as bitumen. The bitumen bound the sand together into the rock formation.

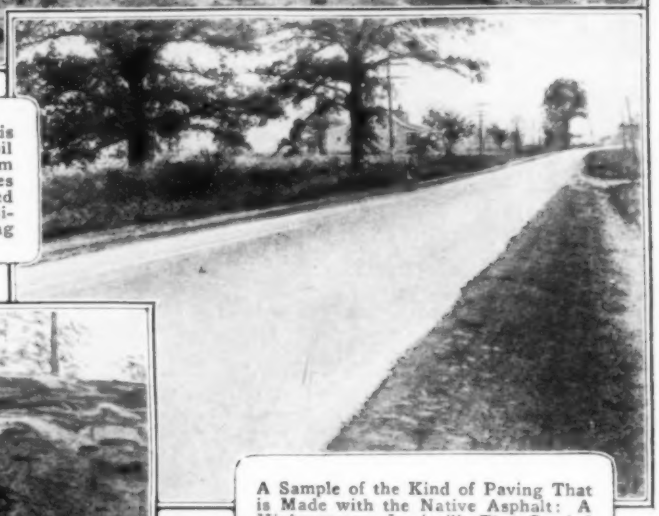
Most sheet asphalts are a mixture of bitumen and sand. To obtain the finished product in Kentucky it is necessary only to break up and pulverize the natural asphalt rock. The pulverized rock can be spread upon the road and rolled, giving a sheet-asphalt surface just like the streets in any American city. Although the presence of this vast asphalt bed has been known for years, the difficulty in getting it from the Kentucky hills has prevented its development until recently. At most seasons access to the quarries is possible only by horseback or by river. Before the asphalt could be produced in any quantities it was necessary to build a town in the wilderness to house the quarrymen and employes of the crushing mills.

First the natural asphalt is quarried like rock. Later the depth of the vein may result in a mining operation. The surface soil, or overburden, is removed with hydraulic pressure. A powerful stream of water uproots trees, dislodges rocks, and washes them away with the soil into the valley. This leaves the asphalt rock exposed and ready for blasting. Donkey locomotives, cranes, and shovels carry the rock to the brow of the hill. From there it is handled by gravity—through the crusher, pulverizing mill, and to the barges on the Nolin River.

Getting the asphalt to the market is another big undertaking. The nearest available railroad point is Bowling Green, Ky., a distance of 71 miles by river. Two large river steamboats and a fleet of barges are used in this traffic. The route is down Nolin River to the famous Green River, down Green to Barren River, and

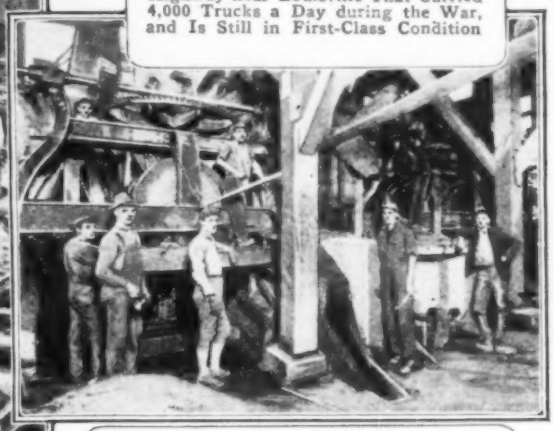


The Hydraulic-Mining Method is Used to Wash Away the Top Soil of the Asphalt Mine, with a Stream of Water So Powerful That Trees and Even Bowlders are Carried Away, Leaving the Exposed Bituminous Mass Ready for Blasting



A Sample of the Kind of Paving That is Made with the Native Asphalt: A Highway near Louisville That Carried 4,000 Trucks a Day during the War, and Is Still in First-Class Condition

The Manner in Which the Solid, Rock-like Bitumen Occurs in the Kentucky Hills Is Apparent in This View of a Vein of Pure Asphalt, 25 Feet Thick and Ready for Mining

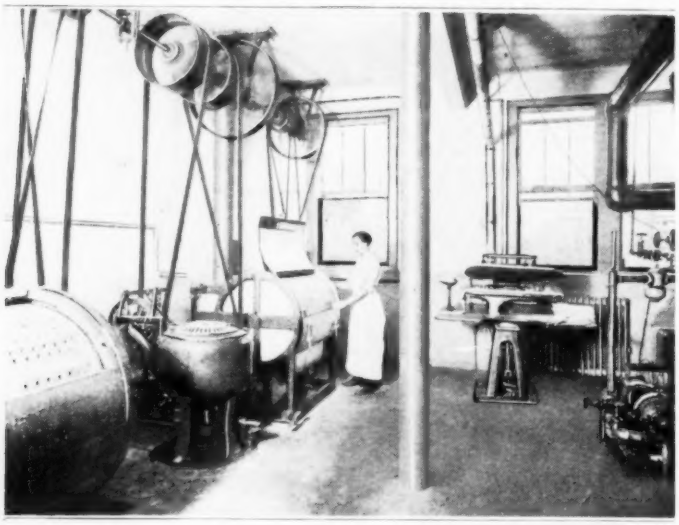


After Passing through a Crusher, the Mined Asphalt is Treated by a Battery of Big Pulverizing Machines, Which Convert It into a Finished Paving Material

up the latter to Bowling Green. At Bowling Green the asphalt is loaded directly into cars or, in winter months, is stored up in a great open pile ready for spring shipment. Although the industry is in its infancy, some three or four hundred men are employed at the quarries, plant, and loading station.

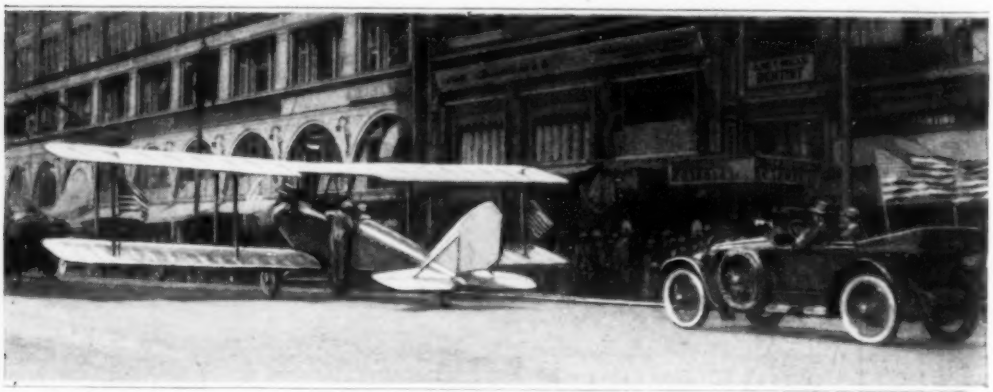
The production of natural asphalt has received a great impetus from the extensive road-building programs of the various states. The fact that it is ready-mixed, and can be laid cold by unskilled workmen, has made it possible to surface country highways with sheet asphalt, where the cost and physical difficulties of laying the hot mixed asphalt prohibited their use.

A COMMUNITY FARM LAUNDRY IN A CREAMERY



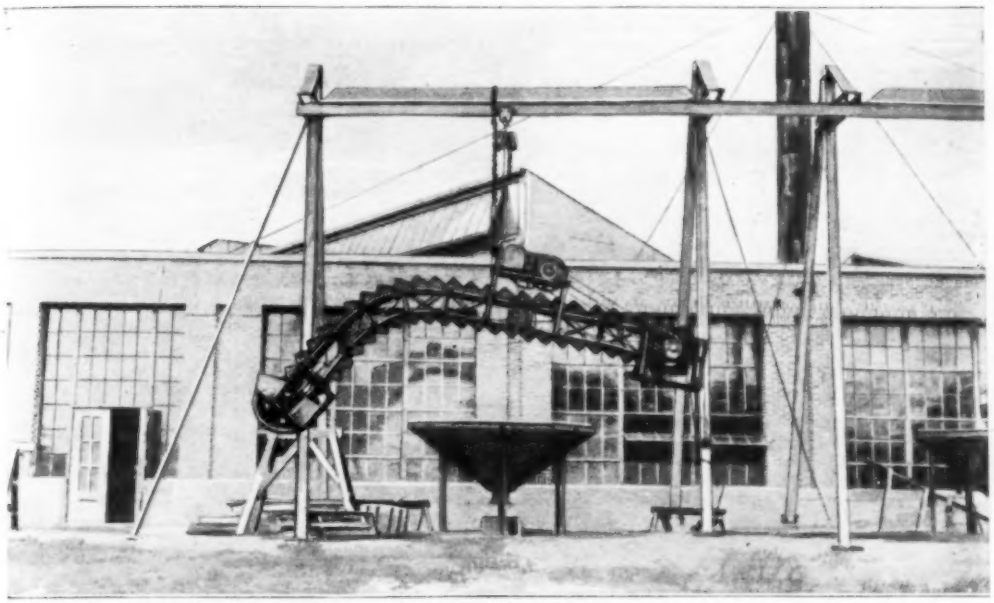
A Typical Installation of Laundry Machinery in a Creamery: Both Space and Power Are Usually Available for This Extra Work, Which Makes It Possible for the Rural Patrons to have Their Washing Done at a Nominal Cost and Saves Much Home Drudgery

Monday will no longer be a day of drudgery and depression in the household in certain farming communities. It is possible to install laundry equipment in a creamery, where space and power are available. The patrons of the creamery may have their entire laundry, including ironing, if desired, done in this manner. In many communities where this plan has been adopted the creameries are run on a coöperative basis. The nominal expense for laundry work is usually charged against the cream checks, by which the creamery makes periodical settlements with its patrons.



AIRPLANE TOWS AUTOMOBILE THROUGH STREETS OF SAN FRANCISCO

DURING preparations for a parade that was staged in San Francisco, Calif., recently, it was arranged that one feature should be an automobile with an airplane in tow. At the eleventh hour it was decided, however, that the combination would attract far more attention if reversed. So, eventually, the watching crowds were presented with the unprecedented spectacle of an airplane taxiing up Market Street, pulling a five-passenger automobile. The plane was maneuvered by the pilot alone, except at abrupt turns where he was assisted by a man or two at the inner wing tip. Though commonplace enough to the blasé fliers, to the spectators the proceeding was an unfamiliar object lesson in the tractive power developed by a propeller revolving in air even at the low speed necessary in a demonstration like this.



A Recently Designed Bucket Conveyor Which Is Part of the Equipment of an Efficiently Designed Foundry: Suspended from an Overhead Trolley, It Scoops Sand or Other Bulk Material Out of the Freight Cars and Carries It to the Hoppers of the Storage Bins

SUSPENDED BUCKET CONVEYOR UNLOADS SAND FROM CARS

The efficiency of modern foundry operations begins with the unloading of core sand and other bulk materials, and for this purpose an improved form of bucket conveyor has been devised by an engineering firm. The conveyor is curved and is operated electrically. It is suspended by means of a chain block and trolley from a substantial overhead track, built parallel with the siding on which the cars stand. In operation, the curved end of the apparatus is lowered into the carload of sand, which is scooped up and carried to the hoppers of storage bins.

CONCRETE-SURFACING MACHINE DOES WORK OF TEN MEN

When the forms, whether of wood or metal, are removed from a piece of concrete work there is left on the surface all manner of irregularities, ranging from joints in the form to the accurately reproduced grain of the wood, when forms of that material are used. To remove these marks has hitherto been a matter of rubbing the marks down with carborundum bricks in the hands of workmen, necessitating much tedious labor. Recently, however, a device has been marketed whereby the work is done mechanically, and with speed and efficiency. A specially constructed chuck holds four carborundum bricks at right angles to each other.

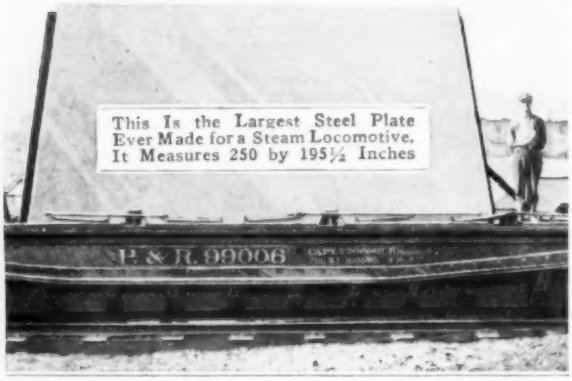
Four Carborundum Bricks are Held at Right Angles to Each Other in a Specially Designed Chuck for Surfacing Concrete Work

The chuck is placed in an electric drill which revolves the abrasive bricks at a rate of about 375 revolutions per minute.

¶If all the railway lines of the United States were electrified, the coal burned under the boilers of their generating plants, according to recent calculations, would amount to 53,500,000 tons, as compared with 175,000,000 tons actually consumed by railroads in 1918.

SINGLE PLATE FORMS CROWN AND SIDES OF FIREBOX

A great steel plate, measuring 250 by 195½ by ½ in., was rolled by a mill in



This Is the Largest Steel Plate Ever Made for a Steam Locomotive. It Measures 250 by 195½ Inches

Coatesville, Pa., recently to form the crown and sides of a locomotive firebox. It is distinguished, consequently, as the largest plate ever made for a steam locomotive. The desirability of eliminating seams is given as the reason for this one-piece construction. For transporting the plate from mill to locomotive works a flat car was remodeled, and the plate was carried upright, with the lower edge within eight inches of the roadbed.

FIGURES ON UNITED STATES COMPILED FROM SURVEY

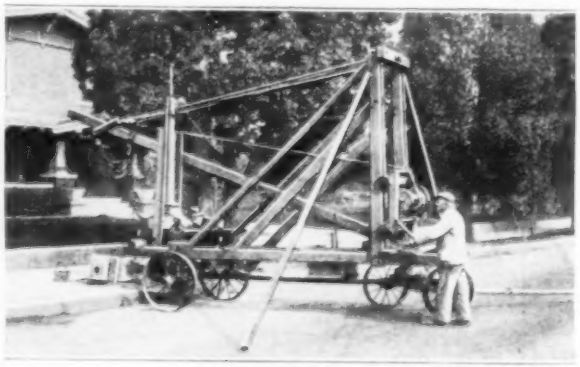
Interesting information about the continental United States has lately been compiled by the U. S. Geological Survey. Of a total area of 3,026,789 square miles, 53,015 is water, not counting the Great Lakes or the Mexican Gulf, leaving 2,973,774 square miles of land. Cape Sable, Fla., is the southernmost point, 49 miles farther south than the lower end of Texas, while a small point of Minnesota extends farthest north, giving a breadth of 1,598 miles. The westward limit is Cape Alva, Wash., and the eastward West Quoddy Head, Me., 2,807 miles apart. The Canadian boundary line is 3,898 miles long, and the Mexican 1,744 miles. The Atlantic coast line is 5,560 miles long, the Pacific 2,730 miles, and the Gulf of Mexico touches 3,640 miles of the country in its wide and irregular sweep.

COMBS SEA DEPTHS TO SOLVE PUZZLE OF SPAWNING EELS

Searching the unknown, lightless depths of the Atlantic Ocean off the Azores, a Danish scientist is working to solve the strange biological mystery of the birth of the common fresh-water eel. It is known that the queer but common snakelike fish, after a long and entirely celibate existence in rivers and creeks, changes its color from yellow to silver, passes down to the sea, and disappears. It is supposed that they never return; that both parents die when the young are born. Eels only one-third of an inch in length, certainly not long hatched, have been caught by this same scientist at the almost incredible depth of 12,000 ft., but the actual spawning process remains an unknown chapter in a curious life history, despite the attention naturalists have given it.

HOISTING MACHINE ALINES CITY'S LAMP-POSTS

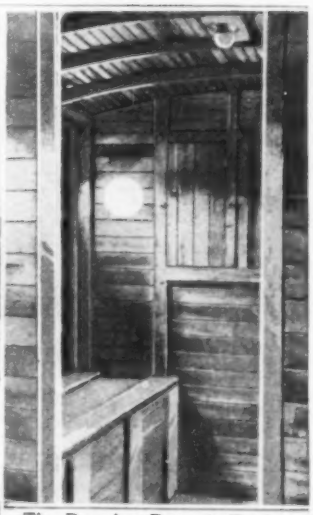
For the single task of straightening lamp-posts, the city of Alhambra, Calif., now maintains a portable hoisting machine. The cost of construction was small, as an old derrick, a windlass, and the running gear of a farm wagon are the essential parts of the apparatus. To employ the machine, it is backed up to the tilted lamp-post, which has been unearthed previously, and the ropes are made fast. The lamp-post is raised; then lowered into position again, being



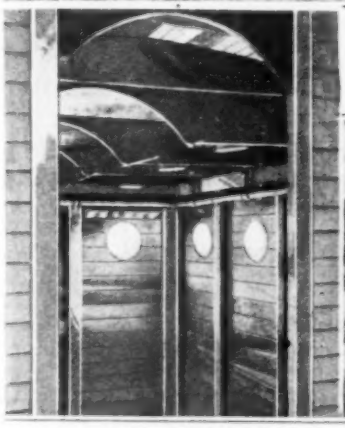
Use of This Extemporized Hoisting Machine Eliminates Much Waste of Time and Labor in the Alining of Street Lamps. The Machine is Towed from Job to Job by an Auto Truck

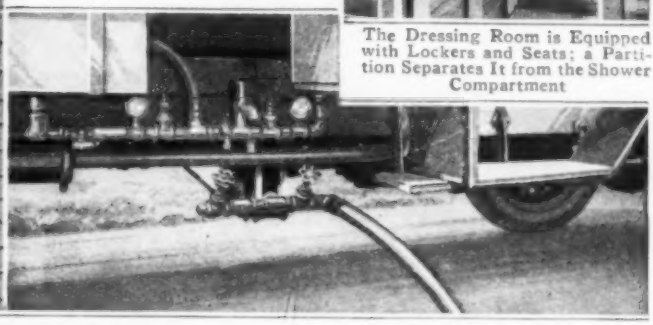
plumbed by means of spirit levels fixed to the upright members of the derrick structure.

The Specially Built Truck, for the Bathing Requirements of Circuses or Military Organizations, is Mounted on a 2½-Ton Chassis



The Dressing Room is Equipped with Lockers and Seats; a Partition Separates It from the Shower Compartment





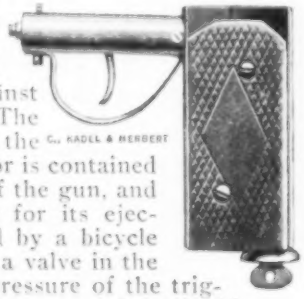
Left: A Glimpse into the Shower-Bath Room. The Shower Heads are Furnished with Hot Water from Tanks Which are Kept Filled by Automatic Devices. Right: A Rotary Gear Pump Delivers the Water to the Shower Heads under Pressure, and can Also be Used for Pumping Water into the Tanks from the Source of Supply

BATH TRUCK FOR CIRCUSES AND MILITARY BODIES

One of the recent developments in motordom is a motor truck equipped for the bathing requirements of circuses, military bodies, and other traveling organizations. The body contains lockers and dressing rooms and is fitted with eight shower heads. Hot water is furnished by automatically operated devices which keep two tanks of 400-gal. combined capacity constantly filled. A 2½-ton chassis is used for carrying the moving-van type of body. The dressing room is 6 by 7 ft., and is equipped with lockers and seats, so arranged as to provide ample space. The shower room is 7 by 8 ft., with the floor sloping downward from the center, and is covered with rubber matting. A telescoping trough underneath the body catches the water and carries it to the rear when the showers are in use. Translucent windows, that are suggestive of portholes, and electric lights provide ample illumination.

GAS PISTOL STOPS ASSAILANT WITHOUT PERMANENT HARM

Poisonous gas, as developed for military purposes, is the ammunition used in a tiny pistol now carried by many persons in Paris as a protection against highwaymen. The liquid source of the unpleasant vapor is contained in the handle of the gun, and compressed air for its ejection is supplied by a bicycle pump, through a valve in the bottom. Each pressure of the trigger throws a fine stream of the liquid 10 ft. or more, generating a gas that temporarily blinds or asphyxiates the assailant and makes him an easy captive.

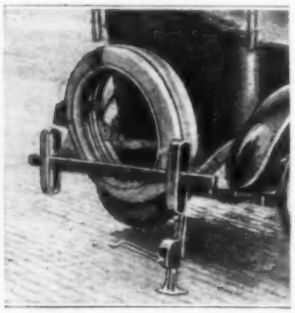


¶Insurance policies covering the full cost of repairing broken eyeglasses are now issued by an Illinois optical concern.

Pulling the New Ocean Pipe Line Out to Sea: The Tank Floating in the Center of the Picture Is the Buoy at the End of the Line, Connected to the Towing Ship by a Stout Manila Hawser

VERTICAL BUMPER REDUCES DAMAGE BY COLLISION

An improved type of automobile bumper, which is attached to the car by means of flexible vertical loops, is claimed to make impossible or, at least reduce damage from rear collisions. The new bumper is attached to the frame of the car, and is so rigid that a jack underneath it will elevate the car without damage to the appliance. The fender of another car cannot ride over or under the bumper.



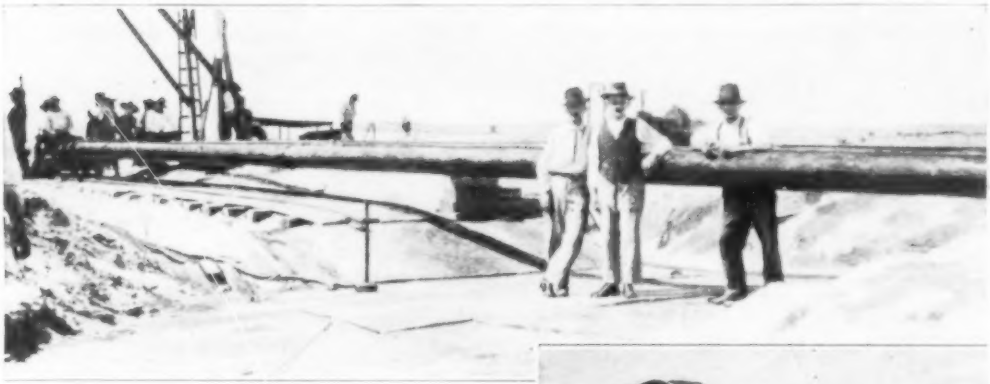
OCEAN PIPE LINE LOADS SHIPS FAR FROM SHORE

Direct delivery of oil from the wells to tank steamers, on a seacoast without a harbor, is an industrial feat accomplished in a novel way by several American companies operating in Mexico. The wells are 20 to 40 miles inland from the east central coast, between the Panuco and Tuxpan rivers. From the shoreline to the 40-ft. depth needed by the tankers is a mile or more. Pipe lines laid from the wells to the coast are of the usual construction, but the method of extending them to the ships at sea is quite interesting.

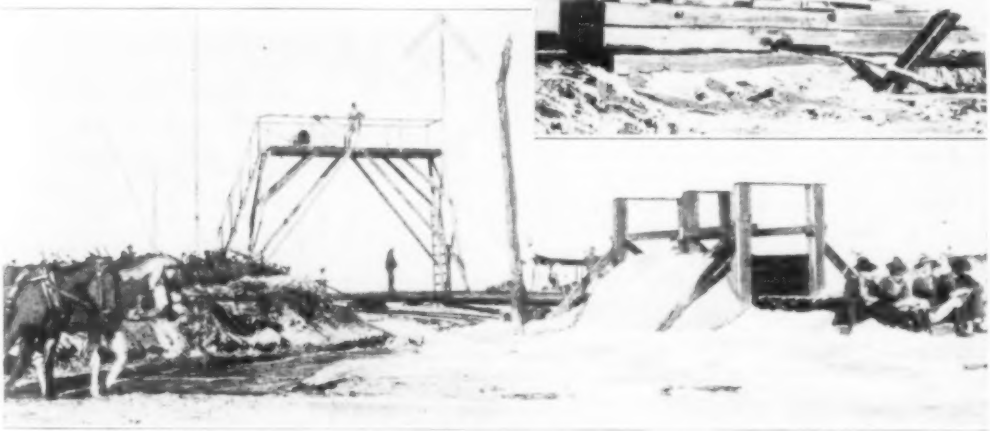
The longest of the 10-in. pipes, laid in pairs on the sea bottom, is 6,500 ft. The greatest width of the beach on which it had to be assembled is only 5,000 ft. A track of 36-in. gauge was laid to the water's edge, with a little steel-floored pit

PHOTOS BY THE GILLIAMS SERVICE

The Straight Line in the Center of the Picture Is the 5,000-Foot Section of Pipe Resting on Its Trucks on the Track. At Its Right Is the 1,500-Foot Section to be Coupled to Its End, Made and Laid Separately Because the Beach Is Only 5,000 Feet Wide



Above: The Pipe Line Running Out to Sea from the End of the Track, the Steel-Floored Pit into Which the Trucks Drop Being in the Center of the Picture. Right: An Empty Gasoline Tank, Used as a Buoy for the End of the Pipe, Resting on the Sand Sled That was Lashed to the Line to Keep It from Burying Itself in the Sea Bottom as It was Dragged Along



PHOTOS FROM THE GILLIAMS SERVICE

A General View of the Works Erected on the Beach to Facilitate the Task: At the Left Is the Signal Tower from Which the Towing Ship was Directed; at the Right, the Guides to Hold the Long Pipe in Line

at the end. Small four-wheeled trucks, one to every second pipe joint, were distributed along the track, and the 5,000 ft. of connected pipe laid on them. To the far end of the pipe a sand sled was lashed, and to the seaward end an empty tank for a buoy.

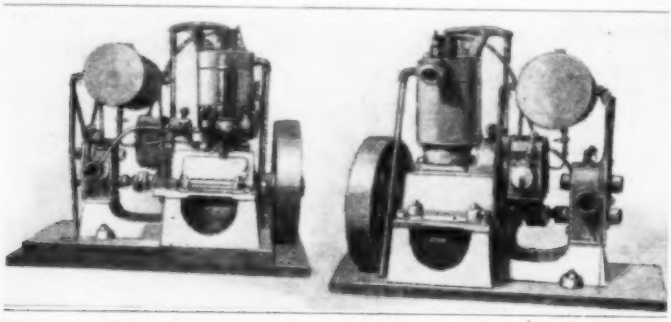
Then a heavy hawser was made fast to the pipe, and a tank steamer, aided by a tug and a mooring boat, pulled the line out to sea, the trucks dropping into the little pit, to be rolled away. When the end of the line was reached, a second section of 1,500 ft. was coupled to it, and the pulling continued, directed from an improvised signal tower on shore. Finally, 150 ft. of flexible hose, with a buoy, was connected to the ocean end. Now a tanker calling for cargo merely fishes up the hose, whistles its signal, the pumps are started, and the loading is finished in short order.

HYDRAULIC BRAKE PREVENTS TAILRACE DAMAGE

One of the problems of hydraulic engineering is the prevention of destructive erosion at the discharge ducts of high-pressure plants. The solution of the problem has been accomplished by forcing the water to take a path through a large horizontal water wheel, where it is diverted into several channels, each tangent to the circumference of the wheel. In this way the force is converted into mechanical energy and also dissipated in the form of heat.

PUMP FIGHTS FOREST FIRES WITH LITTLE FUEL

Designed especially for fighting forest fires, a new unit, comprising a geared rotary pump connected to a single-cylinder gasoline engine, is demonstrating unusual economy, consuming but ⅛ gal. of fuel an hour. The engine uses the 3¼-in. piston and connecting rod of a standard type of light auto, and operates at 400 to 450 r.p.m., with magneto ignition. The pump delivers 40 to 45 gal. of water a minute at 80-lb. pressure, with a 2-in. intake and 1½-in. discharge, and operates well through 800 to 1,000 ft. of hose. The set is easily transported, weighing but 150 lb., or 100 lb. with the flywheel removed, the base, crankcase, and water jacket being of aluminum.



Right and Left-Side Views of the Fire-Fighting Set, a Small Single-Cylinder Gasoline Engine Connected to a Geared Rotary Pump: The Engine Uses the Piston of a Standard Light Auto

ODD SIGNBOARD GIVES VILLAGE'S ALIBI FOR BAD ROAD

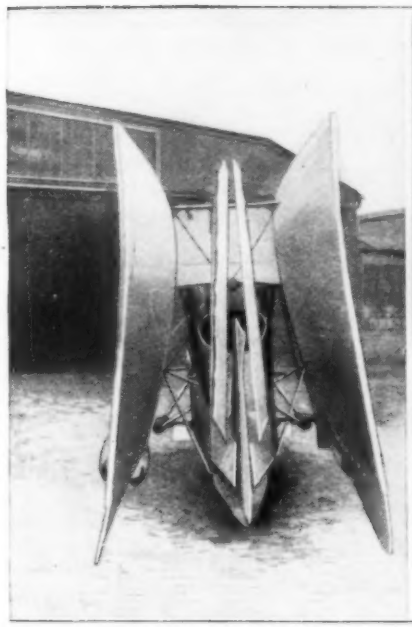
Foreseeing criticism of the bad condition of a neighboring road, although it was not responsible in this respect, the street committee of a New Jersey village erected a signboard which told passing traffic whom to blame for the condition. In this manner much of the criticism that would have been directed against the village authorities by motorists was passed on to the body claimed to be responsible for the road's condition.

In Order to Avoid the Criticism of Motorists and Others for the Bad Condition of a Stretch of Jersey Road over Which the Village Street Committee Had No Jurisdiction, a Conspicuously Displayed Signboard with the Alleged Facts was Erected

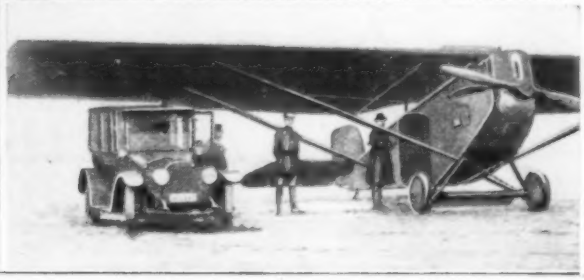
NURSERY ON BEACH GUARDS BABIES FOR BATHERS

In This Bathing-Beach Nursery Babies are Guarded and Entertained, Leaving Parents Free to Amuse Themselves as They Will. Consisting Merely of a Fence and Canvas Roof, It may be Moved Anywhere

Following the lead of various department-store and theater managers, the proprietor of a bathing beach at Santa Monica, Calif., has recently added to the attractions of his resort a small day nursery. Here the babies are kept, while father and mother enjoy the water. The nursery can be established anywhere upon the level sand of the beach, as it consists simply of a light, portable fence and a canvas roof. Beneath the canvas are placed seesaws, swings, and hammocks, all in charge of a capable female attendant.



A Remarkable Test of Strength: Six Men Seated on the Rigid Truss of the Plane



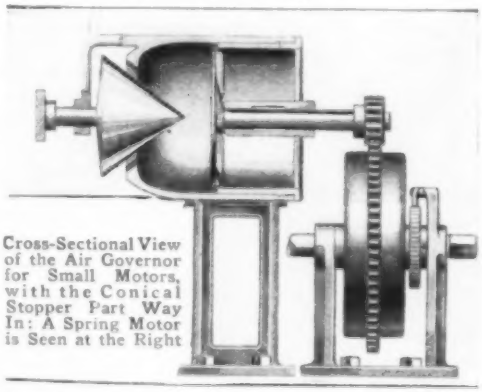
Left: The New Commercial Monoplane with Its Wings Removed and Packed beside the Fuselage, for Shipment or Storage. Right: The Plane Assembled, Showing the Accessibility of the Passenger Entrance

NEW COMMERCIAL MONOPLANE IS QUICKLY DISMANTLED

Easy dismantling for storage or shipment, and quick reassembly, are becoming important considerations in airplane design, particularly for routes where facilities are scarce. A German designer has recently built a monoplane for commercial use which, with its wings packed alongside the fuselage, may be shipped on a single railroad car, and dismantled or assembled in 15 minutes. Instead of wire or cable, the wings are braced by rigid trusses, two to a side, each capable of bearing the weight of six men without loss of alinement. The machine's span is 52½ ft., its length 29½ ft., its height nearly 10 ft., its weight 2,640 lb. empty, and it carries a cargo of 1,870 lb., or seven passengers. It flies at about 100 miles an hour, equipped with a 220 to 260-hp. engine. The width and accessibility of the passenger entrance are an interesting detail.

GOVERNOR FOR SMALL MOTORS USES AIR RESISTANCE

Small motors of both spring and electric types, used for running phonographs, and similar light work, are made to operate at uniform speed by some form of governor, usually of the friction variety. To avoid the disadvantages of rubbing and wearing surfaces an Illinois inventor substitutes air resistance for friction. A small fan revolving in a cylindrical chamber forces air into one end, from which it escapes through a round opening. By means of a conical stopper on a screw, the opening may be reduced or entirely closed, giving an adjustable degree of back pressure of the air against the fan, and so regulating the motor speed.

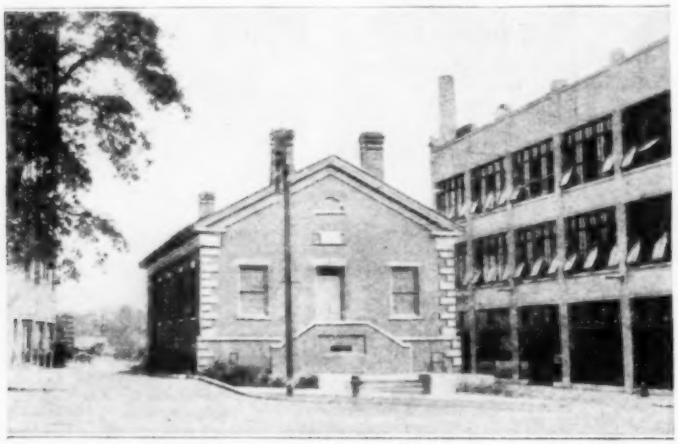


Cross-Sectional View of the Air Governor for Small Motors, with the Conical Stopper Part Way In: A Spring Motor is Seen at the Right

¶ Becoming confused in a fog, the crew of a navy dirigible recently drove it into a mountain top between San Diego and San Pedro, Calif. The commanding officer suffered broken ankles. Others of the crew were badly shaken and bruised.

MORMON SENTIMENT PRESERVES OLD LANDMARK

Sentiment, and nothing else, recently saved from destruction Salt Lake City's "Social Hall," erected more than half a century ago as a community meeting place. The old structure was threatened when the Mormon Church, which had owned it from the beginning, recently regained possession of the surrounding property. At this spot, the church architects planned to construct the most extensive automobile row and one of the finest hotels in the West. And on the plans Social Hall was swept away by a street which would cut the block, and give access to 1,200 additional feet of business front. But destruction of the landmark was disapproved by the church executives. The plans were altered. The hotel and automobile row were shoved to right and left, while the street was split, leaving the Social Hall marooned in the middle. During the course of the construction on either side, the old hall was retrimmed and refurnished.



When Utilitarian Architects would have Removed This Mormon Landmark, Church Authorities Stood Firm for Sentiment, and Salt Lake City's First "Social Hall" Remained

WIRELESS WAVES BENT BY COAST LINES

It has been suspected, for some time, that electric waves are refracted by the shore lines of large bodies of water. Recent observations bear out the theory, and seem to prove that the amount of refraction varies with the length of the wave and the angle at which it crosses the shore. This is to be classed as one of the late discoveries, as it was not generally known during the war.

FAMOUS MARINE REGISTER TO INCLUDE AIR CRAFT

Patterning closely after its highly successful marine-record system, Lloyd's Register of British and Foreign Shipping is now listing all available data regarding aeroplanes, dirigibles, etc., as well as the names, qualifications, and status of pilots. Another great service will be information regarding landing fields, their location and condition, and hangar and mechanical facilities. The marine-survey corps will be augmented by a personnel qualified to pass judgment upon matters pertaining to aeronautics. It is expected that the activities of Lloyd's Aviation Record, the official title of the aeronautical division, will tend to stabilize the design and development of aeroplanes and other types of air craft in the same manner that marine development has been aided and stabilized. As the insurance feature will play a large part in the plans, such an effect is to be anticipated.

TIME SWITCH TURNS ON AUTO LIGHTS AUTOMATICALLY

A time switch for automobiles that automatically turns on the car's lights regardless of where the owner may be at the time, is one of the latest motor accessories to appear on the market. The switch is attachable to any automobile clock and consists of a special glass, to which the inconspicuous switch mechanism is secured. A metal pointer is turned to the desired hour by means of a small knob outside the glass; at the proper time, contact with this pointer is made by the hour hand of the clock, and the circuit is closed, turning on the particular lamps it is desired to control.

To the Clinic Established in Framingham, the Local Mothers Bring Their Babies, Not Because They Are Sick, but So That They may be Kept Well. Already the Infant Death Rate Is Noticeably Lower, and the Health of the Whole Community Greatly Improved by the Interesting Campaign against Disease of Which the Baby Clinic Is Only One Part

THE NATION'S HEALTHIEST TOWN

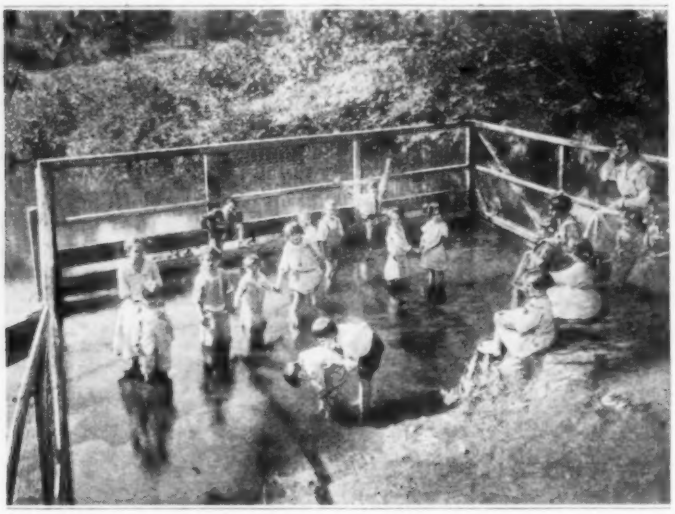
By ROBERT H. MOULTON

AN experiment in health conservation, of nation-wide significance, has been carried on in the town of Framingham, Mass., for the last three years. A campaign scientifically organized has been waged with remarkable success against tuberculosis primarily, but it has of necessity included war upon all disease and disease-breeding conditions. It has made Framingham the nation's premier health town, and it has demonstrated beyond question that a large part of the enormous waste, economic and social, the country now suffers from preventable disease can be stopped just as soon as educated public opinion demands it and takes the proper measures to enforce its demands.

The experiment has shown that the death rate from tuberculosis can be materially reduced and the disease itself ultimately wiped out, and the cost can be defrayed by reasonable taxation that does not impose burdensome financial obligations upon the community. Good health is purchasable and it is within easy reach of any community that is willing to pay for it and has the "sand" and brains to organize for it. Framingham is the na-

The Most Striking and Effective of All Methods of Demonstration, the "Deadly Parallel" of the Right Way and the Wrong Way, was Used in Framingham's Clean-Milk Exhibit

tion's object lesson in the war on disease. Three years ago, when the health station was first established by the National Association for the Study and Prevention of Tuberculosis, Framingham was paying the same amount per capita that is now being paid by practically all the towns in this country—39 cents for health. Today it expends $2 per capita for health. It operates eight free clinics; it has an open-air school; it has a swimming pool for children, and every year it willingly goes under a physical examination in order that disease may be detected early, and so prevented. The result of these efforts is that Framingham has cut its death rates from 121 per 100,000, in 1916, to 76 per 100,000, in 1919.



Even the Children's Wading Pool at the Summer Camp Is in Charge of a Supervisor Who Is a Competent Health Officer, and the Little Ones can Enjoy Their Paddling Secure Not Only from Danger, but from Infections and Colds as Well

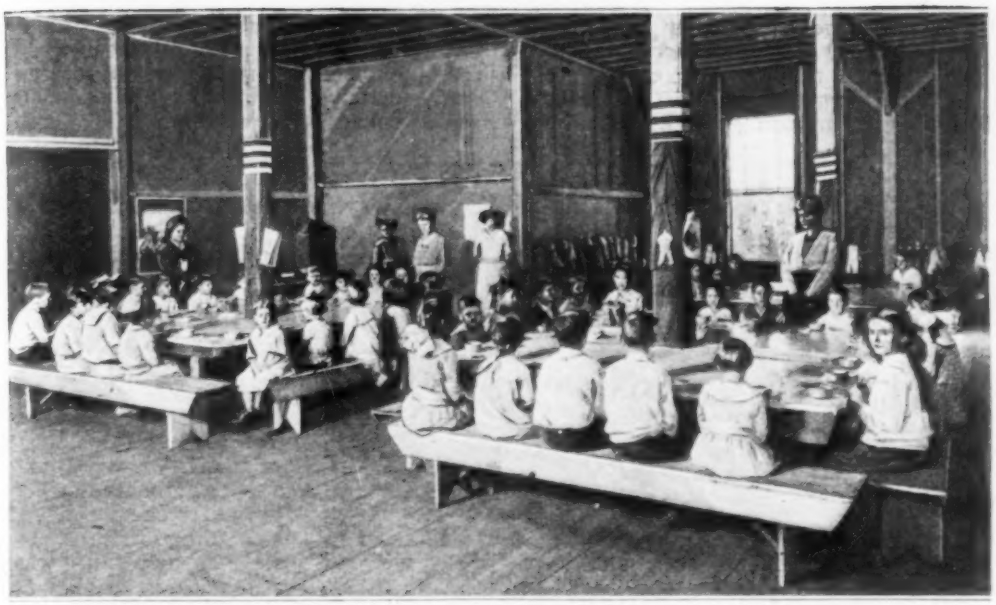
The selection of Framingham was made after several months of study of various communities. The Massachusetts town was found best suited for the needs of the experiment. It has a population of about 17,000 and is situated in eastern Massachusetts, about 21 miles from Boston. It recommended itself as a typical, average community, with mixed industries, varied racial groups, a good local health organization linked with an excellent state department of health, a normal amount of disease, well-trained physicians, good hospitals, and a sufficient promise of coöperation from medical, industrial, commercial, and social organizations to give reasonable assurance of success.

The first examination was held in 1917. It followed a "sickness census" which was begun in November of the previous year, when the health station was established in the city. The census was heralded in the newspapers and by local physicians, but it was too new to be universally accepted, and its findings were too casual to attract attention. It showed, for instance, that the tuberculosis percentage in Framingham was only .24. The following year the medical examination was held. It was conducted by 72 physicians, the local staff being assisted by men called in from 32 outside communities.

Then Framingham woke up. The community examination showed that the percentage of tuberculosis was high, actually 2.16. Thoroughly aroused, the town developed a spirit of coöperation. Clinics were opened and universally used. Today there are in Framingham four infant clinics, one prenatal clinic, one pre-school clinic, one dental clinic for children, and one nose and throat clinic. A consultation service was established. This has become one of the most important features of the health program.

One of the strongest weapons against disease adopted in this progressive town was the result of the necessity for action when the "sickness census" was under way. At that time there were few facilities for taking the census, and means had to be provided. So a citizens' committee consisting of 500 residents, was formed. Each of the 500 was made responsible for 20 families, and today the committee is one of the most important features of the entire campaign. It not only brings in valuable information about home life and conditions, but it also reports births, deaths, the discovery of tuberculosis, and many other diseases.

Through such agencies direct points of contact with the homes of the city were made by the community health center. Nurses, equipped with report blanks, visited the homes and gained information that would otherwise be unavailable. They construed the word "illness" liberally. They sought out and found the actual medical history of the family and



The Lunch Hour at the Children's Camp: Several Hundreds of Children of Pre-School Age have Attended This Camp Since It was Established, and have Learned There How to Keep Well during the Winter Months After They have Started to Attend School

began at once to correct faults which had cropped up. In that way health was brought to the homes. Health measures began to be universally adopted and practiced.

The nurses learned that the people wanted more information every day. They taught them how to prepare food, how to eliminate flies, mosquitoes, and other pests. The nurses gave advice on baby feeding and the welfare of children. They supplemented it with suggestions at the clinic. They brought good housing conditions into being, and taught the necessity of plenty of fresh air. Food, hygiene, and general health rules were prescribed and practiced. Mothers began to visit the clinics. They no longer waited until the children were actually ill. They took them to the dispensaries when they were apparently well and cheerfully received advice and applied it. A huge cut in the death rate of babies was the result. Local milk conditions were carefully studied and plans developed for the improvement of the economic and sanitary aspects of milk handling.

Two years ago, Framingham insisted that something should be done to prepare children for the winter months in school. It was all part of the health ideals of the city: to get good health and to keep it. So there was organized a novel summer camp, or pre-school clinic, which the children attend during the summer months, and which has helped materially to cut

The Children's Health Camp Is Really a Pre-School Clinic. The Young Children Attend It during the Summer Months, and Enjoy Their Stay Thoroughly, but They Are Always under Supervision and Carefully Guarded from Sickness

down the sickness rate through the winter. About 450 children under school age have attended this summer camp.

But the longest and most important step toward constant good health which has been made lies in the physical examinations to which the adults of the town have submitted. Up to a few months ago approximately 14,000 out of the 17,000 residents had been examined.

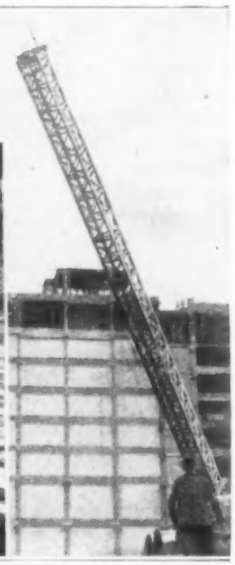
RACE FOR FREE LUNCH IS NEW AQUATIC SPORT

To Succeed at the Newest Water Sport the Swimmer must Be Able to Secure His Sandwich or Piece of Pie without Touching Boat or "Spoon," and must, of Course, Know How to Eat without Sinking. The "Spoons" Are Empty Cigar Boxes on the Ends of Short Poles, Held over the Side of the Boat by the Oarsmen

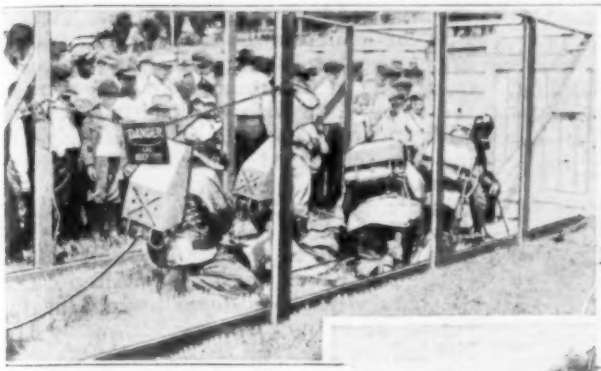
Sandwiches, pieces of pie, a rowboat, and several empty cigar boxes, fastened, like the bowls of spoons, to the ends of short poles, are the paraphernalia needed for the playing of a water game recently devised at Venice, Calif. Having anchored the boat in rather deep water, the occupants place the food in the "spoons," and hold these over the sides. The swimmers then race out to the boat, and try to seize the viands. This they are not allowed to do, if, in the attempt, they touch boat or boxes. The food is eaten when secured, if, again, the swimmer knows how to keep afloat.

260-FOOT ELEVATOR TOWER PULLED TO GROUND

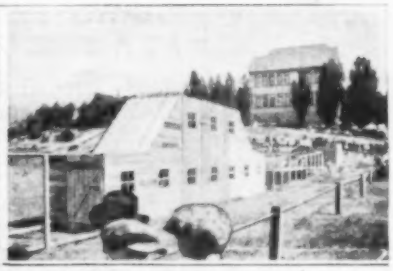
Economy of time being more desired than economy of material, the 260-ft. wooden elevator tower used in the construction of a large building in Portland, Ore., was recently demolished by the simple expedient of pulling it to the ground. For this purpose a wire cable, 400 ft. long, was fastened to the top, and wound around the drum of a hoisting engine half a block away. As the drum revolved, the top of the tower described a majestic arc which terminated, to the delight of a large crowd, in a splintering crash. The tower is said to have been one of the tallest ever built in the West for the familiar purpose of spouting concrete to the forms. About 25,000 cu. yd. were distributed in this way.



Hardly One Unshattered Timber was Found in the Ruins of the Tower Pictured at the Left. As Shown at the Right, It was Caught by the Camera an Instant After It had been Pulled from the Vertical by the Engine-Driven Hoisting Drum, Which was Attached to Its Top by Means of a 400-Foot Wire Cable



Preparing to Enter a Gas-Filled Section of the Demonstration "Mine": Four Members of the Rescue Team are Carrying the Fifth on a Litter



An Air-Tight Wooden Structure, Filled with Gas to Simulate as Nearly as Possible Conditions Encountered in Rescue Work: Observation Windows were Made for the Judges

Left: Rock Falls and Other Artificial Obstructions were Provided throughout the Length of the "Mine" over Which the Competing Teams were Required to Carry One of Their Number. Right: One of the Eight Mine-Rescue Corps Which Participated in the Tournament, Wearing Oxygen Helmets and Other Equipment

COAL MINERS' RESCUE TEAMS COMPETE IN BIG TOURNEY

The mine-rescue corps of eight Washington coal mines were the recent competitors in a state contest at Roslyn. For the purpose of testing the skill of the various teams, which were composed of five men each, an artificial mine was constructed in the open air, of wood, and at one section a frame building with observation windows for the judges was erected. In the contest, each team, wearing oxygen helmets and full equipment, was required to carry one of its number on a stretcher through the gas-filled frame building and out again to encounter various artificial obstructions likely to be met in actual practice, such as rock falls, and the like.

BABY CAB BUILT AS SIDECAR FOR ORDINARY BICYCLE

Sidecars are usually thought of as adjuncts peculiar to motorcycles, but one now made, in the form of a baby cab, is intended for attachment to the frame of an ordinary bicycle. The body, supported by two large and easy springs, carries a tiny windshield and a folding top for the comfort of the small occupant, and the wheel is protected by a mudguard. The car may be attached or detached very quickly, and when installed does not interfere with the cyclist.

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A Baby-Cab Sidecar with Windshield and Folding Top, Attached to the Frame of an Ordinary Bicycle

CONCRETE HIGHWAY REBUILT HALF AT A TIME

The old "bromide" notwithstanding, "doing things by halves" is sometimes the best method of doing things. A section of concrete highway broke down under the heavy traffic it was subjected to, and had to be rebuilt. In order to get the work done with as little interference with traffic as possible, it was decided to lay the reinforced concrete in two sections. A 6-in. layer of concrete, with the reinforcing bars imbedded in it, was laid down over half the road and the steel bars bent up to keep out traffic which continued using the other half. Later the bars were bent down and traffic diverted over the new surface, while the last half of the road was completed.

In Order to Rebuild a Stretch of Concrete Highway without Interfering with Traffic, Half of the Work was Done at a Time, the Reinforcing Bars Forming a Fence That Kept Vehicles from the New-Laid Half

¶The University of Colorado is establishing a research laboratory for the development of a commercial method of producing petroleum from shales.

ARCTIC SEALING OFF TEMPERATE SHORES

By LAWRENCE WILLIAM PEDROSE

OFF the coast of the state of Washington is the only place in the world where fur seals are hunted in the summertime, and permission for sealing is restricted to the Quillayute, Ozette, and Makah tribes of Indians, whose rights are guaranteed by a treaty signed 10 years ago between the United States, England, Russia, and Japan.

This sealing, although conducted in a temperate clime, is beset with many hazards. Motorboats, and any weapons other than the Indian spear, are prohibited, so the sealers venture out upon the open ocean in their frail, hewn log canoes and with only primitive hand weapons, as did the hunters of Indian traditions.

The sealing "grounds" lie 30 miles, or more, out on the Pacific, along the route of the migratory passage of the fur seal from the Arctic to its breeding grounds in the Tropics. The great seal herds, in their several-thousand-mile journey, pause for rest, and the Indian hunters steal up on the sleeping mammals before sunrise in the morning.

May and June are the "flush" months for this sealing, and although the Indian hunter may spend the other 10 months of the year in recreation, his earnings for these two months aggregate $2,000 to $3,000 every year.

The Indian seal hunter's life is filled with romance. He does not know, when he embarks in his canoe, what adventure may befall him before he returns to shore. The ocean is always tumultuous, and a fog may settle down or a storm arise at any moment. Some 20 canoes, containing three men each, start at midnight for the distant sealing grounds, which they plan to reach before sunrise. Their return is the big event in the life of the Indian village. At about two o'clock in the afternoon, anxious wives and children of the hunters climb to the highest points along the shore and scan the ocean for a sight of the returning canoes. When the wind is high and the shore is whipped by whitecaps, anxiety reigns. News that the first sail is sighted brings the whole village down to the shore. Scores of willing hands are waiting to assist the weary hunters out of their canoes and drag the catch up onto the beach.

Rewards of the hunt, if the seals are found as anticipated and a storm does not interfere, are about six seals per man for the day's work. This year the pelts are bringing $31 each, a very satisfactory return from the Indians' point of view, since in former years they received only $12 per skin. Buyers come to the Indian village for the pelts, which are carefully washed and packed away in salt by the hunters after their return from the chase.

Although the government restricts the Indians to primitive methods in their seal hunting, they are quite up-to-date in their ways of spending the proceeds from the harvest. Some have motor cars, others have speed boats or racing horses; almost all have phonographs and other modern conveniences in their homes.

The Indians Hunt the Migratory Fur Seals on the Open Sea in the Frailest of Canoes and Boats, but, as Seen in This Instance, They Usually Bring Home the Game

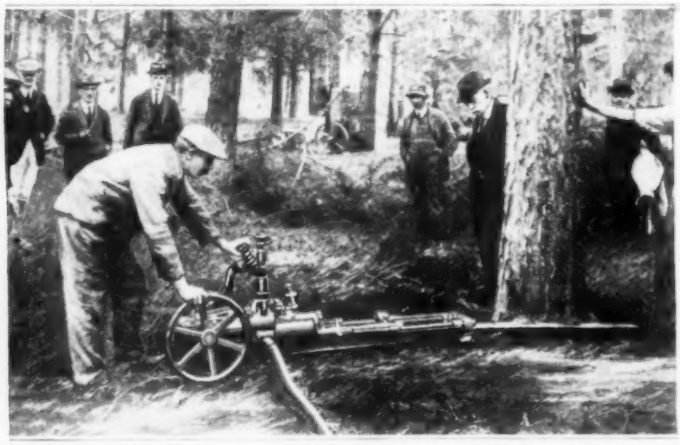
In a Fair Breeze, the Indians Set Sails on Their Canoes, Which Are Often but Log Dugouts of the Most Primitive Type, Whose Safety is Not Increased by the Spread of Canvas. The Familiar Swastika on the Forward Sail Is the Age-Old Token of Good Luck

The Hunter in the Center of the Picture Gets Six Seals as His Share of the Canoe's Capture, Which will Bring Him $31 Each, besides a Large Amount of Meat and Fat. Ready for the Market, the Pelts Are Worth Thousands of Dollars

One of the Primitive Harpoons That are Used by the Indian Sealers Because the Government will Not Permit the Use of Modern Equipment: The Double Head Has Detachable Metal Points and Barbs, to Which Lines are Attached

TREE-FELLING MACHINE BEARS SAW ON END OF PISTON ROD

A public demonstration was staged in England recently of a quick-acting tree-felling machine. It consists of a heavy crosscut saw which is really a continuation of the piston rod of a steam-engine cylinder. This cylinder is mounted horizontally on a portable wrought-iron frame by means of a pivot, and is turned about this pivot, as the saw bites into the tree, by means of a rack-and-pinion adjustment. Steam for the cylinder is supplied through a long hose from a wheel-mounted boiler. The teeth of the saw, it may be explained, are of such a form that the blade cuts only on the inward stroke of the piston.



The Tree-Felling Machine Consists Essentially of a Saw Connected Directly to the Piston Rod of a Portable Steam-Engine Cylinder. Adjustment is Made by Means of the Handwheel

EFFECTS OF OUTSIDE FACTORS ON MUSCULAR STRENGTH

Current discussions on the relative productiveness of labor lend additional interest to the results of tests recently conducted by a western scientist to determine the effects of outside influences on muscular strength. Climatic factors are found important, a continuous temperature of more than 86° F. being unfavorable to performance, while between 70 and 80-per-cent humidity is favorable. Excessive fatigue carries its effects over to the following day, and even longer. A curious discovery is that a number of men engaged on a specific task of hard labor become of practically equal strength. Close application and unpleasant surroundings have a definite fatigue effect.

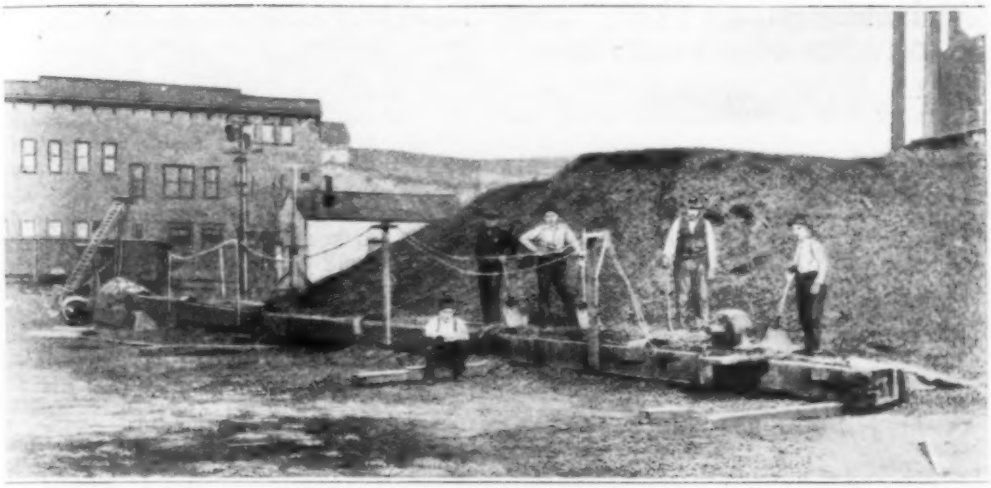
SHOOT TARGETS FROM PLANES IN FIRST AERIAL MATCH

Five airplanes competed at Camp Perry, Ohio, recently, in the first aerial shooting match ever held in this country. Some interesting scores were made, the winning team making 520 points out of a possible 800, using modern-type machine guns and a plane of late model. The pilot scored 270 points against an upright target, of a possible 300, and his observer made 250, of a possible 500, on a recumbent target. The winners of second honors, with an older machine and guns, secured a total of 462 points. During the competition, one of the planes met with an accident, and was wrecked. Demonstration shooting from rocking nacelles on the ground was another unusual event of the meet.

BUNGALOW WITH DOMED ROOF RESEMBLES OBSERVATORY

When carpenters placed the roof on a new bungalow not long ago, residents of an outlying Los Angeles district felt sure that the neighborhood was to be distinguished, thereafter, by the presence of an astronomical observatory. The owner disillusioned them, however, by explaining that the domed roof over the sitting room was built simply to make the house more comfortable in hot weather. The air space beneath the dome insulates the room below from the heat of the noonday sun.

This Domed Roof Provides Air Space above the Sitting Room, and So Keeps the Room Cool during the Hot Summer Months



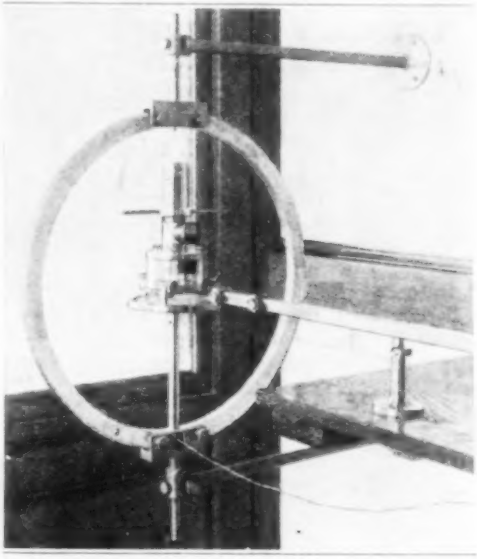
The Use of the Rude Spiral Conveyor Seen in the Foreground Enabled These Five Shovelers to Do the Work of Four Times Their Number. Carried down the Trough, the Peach Stones Emptied into a Second Conveyor, and Thence into the Buckets of the Elevator, Seen at the Left

HOMEMADE CONVEYOR HASTENS BIG SHOVELING JOB

A contractor's ingenuity recently enabled five men to shovel into freight cars, in record time, a pile of peach stones that covered an acre of ground to a depth of 14 ft. At right angles to the railroad track, and beside the pile, he placed a spiral conveyor, the trough of which he made of heavy planks. Current for the electric motor was supplied through wires carried on poles bolted to the sides of the conveyor. Shoveled into the trough, the stones were carried to a second, similar conveyor, and thence to an elevator which poured them into the car. As the pile dwindled beneath the attack of the five shovelers the conveyor was constantly shifted toward them.

TESTING MAGNETIC MOMENT OF COMPASS MAGNETS

Among other very useful testing instruments that have been developed by the Bureau of Standards is a special type of magnetometer for testing the strength, or magnetic moment, of magnets generally, and which greatly simplifies the testing of ship and airplane compasses. The magnetic moment is the measure of the turning force with which the magnetic needle tends to return to the northerly direction when, for any reason, it has become displaced. A control magnet, which extends horizontally from the top of the instrument, serves as a means to alter the sensitiveness of the latter to any convenient value, and permits the needle system of a compass to be tested without clamping



The Magnetometer Is a Recently Developed Instrument of the Bureau of Standards, for Testing the Strength of Magnets Generally, and for Simplifying the Verification of Ship and Airplane Compasses

or turning it about to any particular position in relation to the earth's magnetic field.

¶Stunt flying is regarded with a conservative eye in Switzerland, and under a new ruling airmen ambitious to try it must get a special license, an official examination of the machine, and an insurance policy for 3,750 dollars.

USES ARGENTINA'S FIRST SNOW FOR BUST OF WASHINGTON

A life-size bust of George Washington, very well executed considering the material of which it was made, was recently modeled under extraordinary circumstances by a sculptor in Tucuman, Argentina. On July 12, midwinter below the equator, the northern provinces of that South American country were visited by the first snowstorm of their entire history. The local population was quick to seize this new opportunity to mold figures and missiles of the rare plastic, and most pretentious of the former was the statue of the early American, which effective though ephemeral work of art was viewed with an interest and approval apparently significant of interracial esteem. The snowfall was not wholly beneficent, however, for it did much damage to the sugar-cane crop, causing the loss of one-fourth of Argentina's sugar production.

A Bust of George Washington, Modeled with the First Snow That Ever Fell in Northern Argentina, and Apparently Viewed with Friendly Approval by the Local Residents

REFRESHMENT STAND UNIQUELY PRESERVES OLD STAGECOACH

When the automobile stages forced the owner and his horse-drawn stage off the trail, the old coach was left to the mercy of wind and weather until converted into a wayside refreshment stand. The relic of a day that has passed, but left its glamour of romance, has had its body enlarged, and there is just room enough inside for the proprietor, his stock of goods, his ice box, and his gasoline stove.

Crowded off the Trail by the Automobile, the Owner of an Old Stagecoach Altered It to Make a Wayside Refreshment Stand for the Convenience of Travelers

A Photograph Taken at 2:30 in the Morning in the Summit House on Pikes Peak, by a Long Exposure: The Early Dawn Characteristic of the Elevation Is Already Evident, Despite the Hour. The Tourists are Waiting for the Sun to Rise

PHOTOGRAPH TAKEN IN THE SUMMIT HOUSE ON PIKES PEAK

An interesting photograph was taken at 2:30 a. m. in the Summit House on Pikes Peak, while waiting for the sun to rise, a lengthy exposure being made. While the lower part of the room is heavily shadowed, the faces of the occupants are quite distinct. The sun rises about 3:15 in summer, and the commanding height of the mountain permits the view of a wonderful sunrise, a sight familiar to tourists who make the early ascent.

KEELS ARE LAID FOR GIANT NEW BATTLE CRUISERS

Six new United States battle cruisers, the largest and fastest in the world, are now actually under construction, the keels of three having been laid within a few hours recently in an eastern shipyard. The new ships are to be the "Ranger," the "Constellation," the "Saratoga," the "Lexington," the "Constitution," and the "United States," and will cost $24,000,000 each. The second-named, which may be taken as a type, will be 874 ft. long, 101 ft. 8¼ in. wide at the waterline, and 31-ft. mean draft, with a displacement of 43,500 tons. It will be armed with eight 16-in. turret guns, sixteen 6-in. secondary guns, four 3-in. anti-aircraft guns, four 6-lb. saluting guns, and eight 21-in. torpedo tubes, four submerged and four exposed. The power plant will develop the tremendous total of 180,000 hp., the equipment including four turbines using steam at 265 lb., direct-connected to four 40,000-kva. generators, giving alternating current of 51.3 cycles at 5,400 volts, and eight 22,500-hp. motors, two driving each propeller. The cruiser is designed for a speed of more than 38 miles an hour.

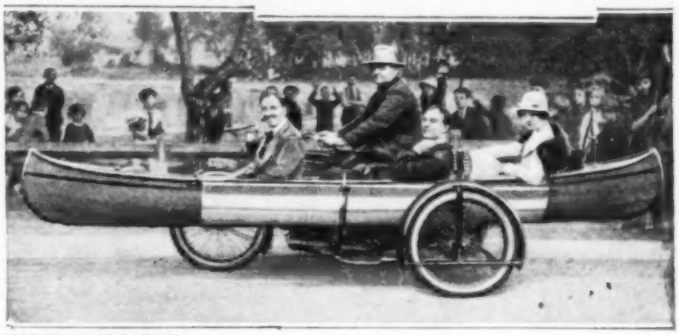
HOBO TRUCK EARNS EXPENSES AND SURPLUS ON LONG RUN

Governed by the condition that no money or article of value, other than in payment for haulage services, was to be accepted en route, the sales manager of a Wisconsin truck factory, accompanied by a driver, recently made a round trip to the western coast. Two other conditions were that neither of the crew was to have funds at the start and that no two loads were to be of the same kind. Although the charges for services were nominal, all expenses, including tire and truck-depreciation charges, were met, and a tidy surplus entered to the truck's credit.

MOTORCYCLE CARRIES CANOE ON SIDECAR FRAME

Transporting a boat of any kind, even a light canoe, overland is one of the most awkward of tasks, for which a wagon or trailer is usually needed. An English inventor, however, now has not only greatly simplified the proceeding, but has given it additional interest. By means of a frame similar to that of an ordinary sidecar, the canoe is fitted, in its natural position, at the side of a motorcycle. The craft is quickly and easily detached from the frame when the water is reached, and while it is being carried it accommodates three passengers in comfort, thus greatly increasing the motorcycle's usefulness.

The Motorcycle with Its Special Side Frame Carrying a Canoe to Water



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In Its Transportation by Motorcycle, the Canoe Serves as a Sidecar in Which Three Passengers may be Comfortably Carried, and When the Water is Reached, the Craft is Quickly Disengaged from the Wheeled Frame, and Launched

¶Experiments in preserving stone surfaces by coating them with colorless protective agents are being conducted by the Bureau of Standards. The investigation, though inspired by the desire to save some prehistoric inscriptions in New Mexican sandstone, is of interest in connection with building maintenance.

NEW SAFETY INCINERATOR OF CONCRETE BLOCKS

The burning of rubbish in the ordinary wire crate is apt to be attended with considerable irritation and trouble, particularly in sections where there are rainless summer months. A safety incinerator recently introduced removes these difficulties. It is portable and consists simply of three hollow concrete blocks, with 3-in. walls, which are placed one on top of the other. A galvanized-iron netting covers the top and may be raised to put in the rubbish. The ashes are removed through a small opening in the bottom block.

TELEPHONE COIN-BOX ROBBERS CAUGHT BY SPECIAL ALARM

Robberies of coin boxes in telephone pay stations, which are declared to have cost the operating company in a midwest city $20,000 in six weeks, were brought to an abrupt end recently by the installation of a special system of alarms. A number of the boxes in public places were so wired that a local warning was sounded as soon as a key was thrust into the lock. When two of the burglarious gang attempted to rifle the stations in the lobby of a theater, the alarm sounded, and they were immediately caught. In their possession were found keys to fit the different types of locks used, of which there are only 10 varieties.

DEVICE FOR AUDITING MOTOR COSTS ATTACHED TO CAR

Motor-car owners who want an accurate account of their operating expenses can keep such a record by means of a recently introduced "auditing machine," which is conveniently attached to the instrument board. The device consists of an attractively enameled metal case, which holds a roll of paper sufficient for a season's use; the paper is drawn across the face of an opening by a knurled screw, and upkeep items are entered on the exposed surface. The entire roll, or any part of it, can be removed at any time, making it possible to keep a memorandum of the car's operating cost for any desired period during the year.

ASSEMBLING SEAPLANES AT A NAVAL AIR STATION

By FRANK B. HOWE

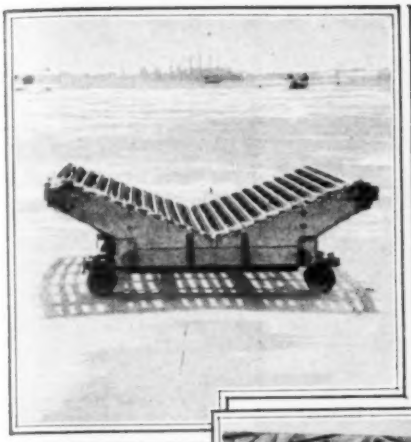
A SYSTEM of assembling, testing, and launching seaplanes, which is declared to be unexcelled in speed, accuracy, and efficiency, has been established at the naval air station, at San Diego, Calif. Starting with a wide concrete floor, which extends down into the bay, huge concrete sheds were built on either side, leaving the central floor open and unobstructed. These concrete sheds have no front or rear walls and in the roof are placed a large number of steel bars, so arranged that a block and tackle can be instantly attached at almost any point.

Wooden cradles, so fashioned that the body of the plane just fits in them securely, were next built and mounted on wheels.

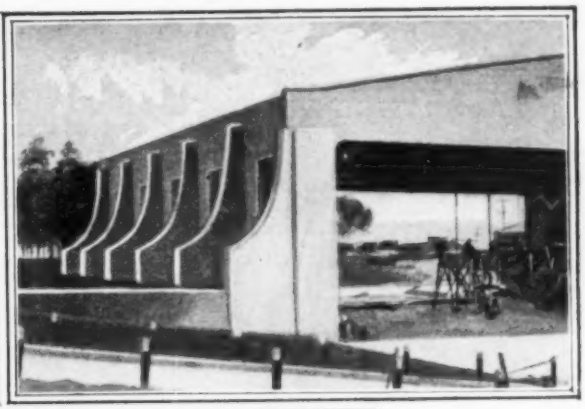
When a knocked-down plane arrives at the station, it is uncrated in one of these open sheds and built up gradually, being set right into the cradle at the start, just as a ship's keel plate is laid. When the craft is all put together, it is wheeled out into the open, on the concrete floor, and the engine tested. It is then ready to be launched.

Launching is accomplished by letting the plane move under its own power down the floor and out into the bay, leaving the cradle, as soon as it floats on the water. A small tractor is then attached to the cradle and it is pulled back to receive another plane.

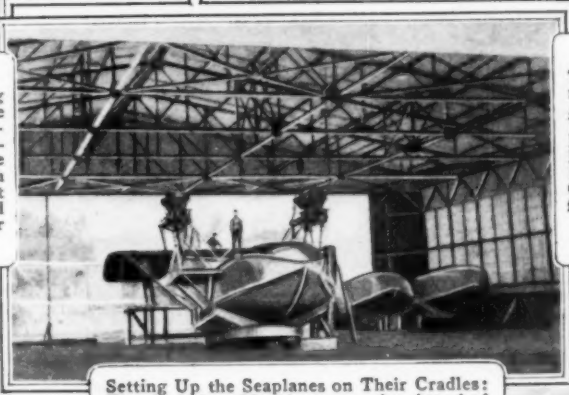
When it is desired to bring a launched plane back to the sheds for repairs, it is, of course, a very simple matter to slide the cradle under it in the water, and haul both, with the tractor, back up the incline and into the shed.



One of the Launching Cradles, on Which the Knocked-Down Seaplane is Laid and Assembled, and Where It Remains, through Various Tests, Until It is Actually Launched under Its Own Power

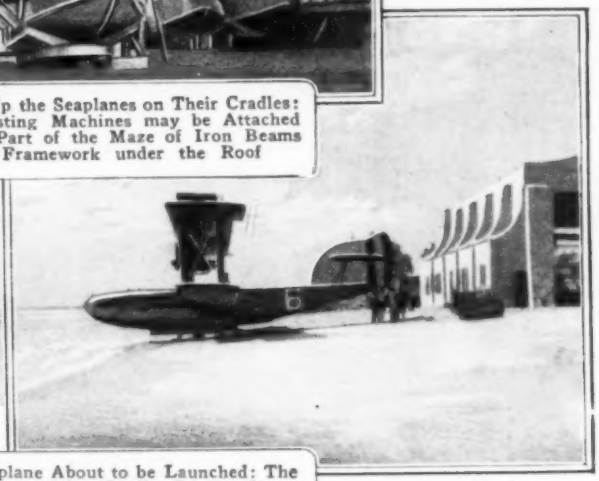


The Somewhat Ornamental Ribs That Adorn the Outside Walls of the Concrete Buildings Are Really Heavy Braces, Made Necessary by the Constant and Powerful Vibrations of the Big Motors Inside



Setting Up the Seaplanes on Their Cradles: The Hoisting Machines may be Attached to Any Part of the Maze of Iron Beams and Framework under the Roof

The Type of Tractor Used in Retrieving the Cradle from the Sea: When the Seaplane has Risen, Leaving Its Cradle Floating, This Machine is Tied to It, and Brings It Back up the Runway and into the Shed

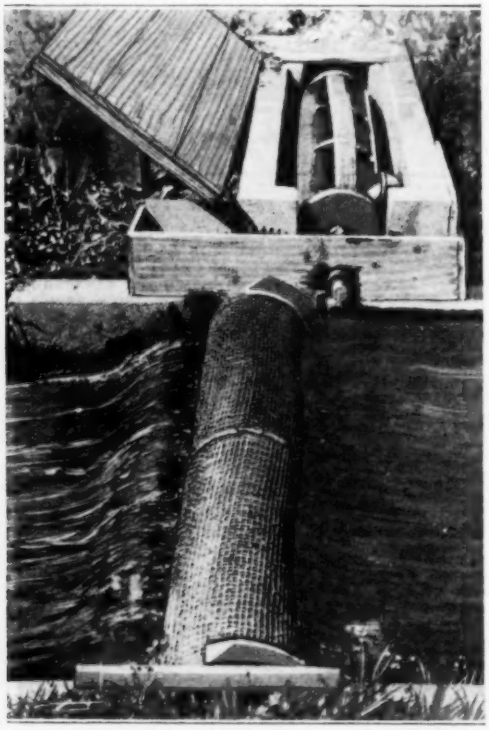


A Seaplane About to be Launched: The Wheels on the Cradle Enable It to Coast down the Concrete Runway, on Its Own Power, into the Sea, Where the Cradle Floats Away

Looking down the Concrete Runway toward the Sea: Besides the Plane in the Foreground, One may be Seen at the Water's Edge, with Its Recovered Cradle and the Towing Lines Visible at the Left

SCREEN KEEPS FISH FROM IRRIGATING DITCHES

Farmers in irrigated sections of some states who receive permission to divert water from streams, must provide means of preventing the entrance of fish into their ditches.



A Revolving Screen Which Prevents the Escape of Fish from State Streams from Which Water is Diverted for Irrigation: At the Top is the Water-Motor That Drives the Screen

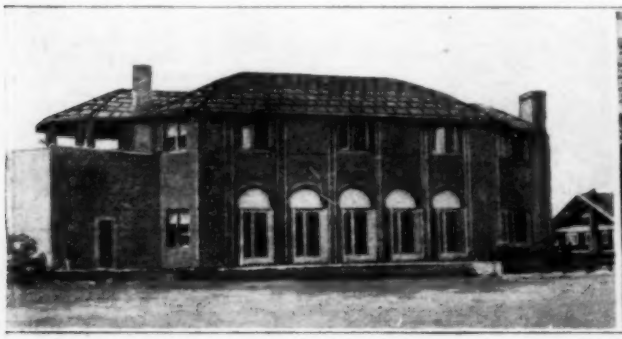
A fish-hatchery official has invented a revolving screen which is operated by a motor driven by power from the stream in which it is installed, the water being conducted to it by a system of pipe lines. As the screen is constantly revolving, the accumulation of refuse against it is prevented and at the same time the fish are kept in the stream.

TIMBER DESTRUCTION BY ANTS PREVENTED IN JAPAN

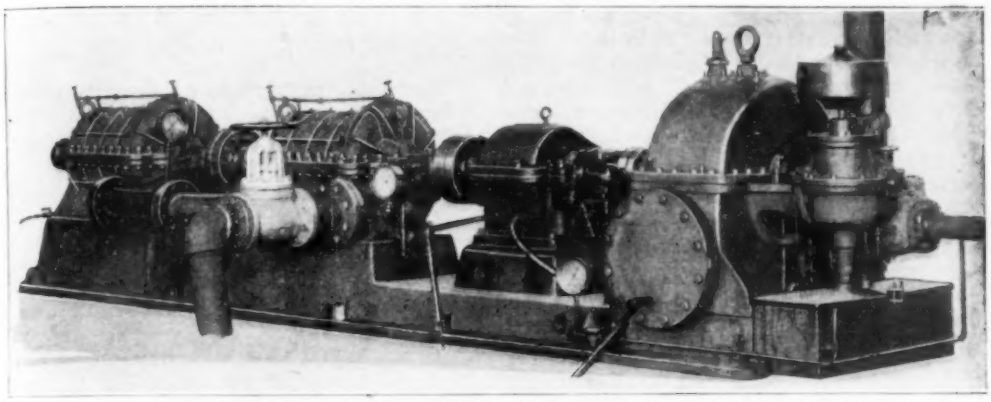
Tropical ants, otherwise known as termites, have always proven a menace to buildings, trestles, and other wooden structures in the Orient. The Japanese have found that some of the coal-tar distillates afford a fair measure of protection against the depredations of the pests. Owing to a somewhat disagreeable odor, these oils are not used on lumber intended for dwellings. The only woods immune from the attack of the insects are teak and deodar, better known as cypress pine. These two woods contain benzene, one of the carbohydrates, which is practically identical with one of the commonest of the coal-tar derivatives. It is supposed that the termites dislike the odor or taste of the oils.

BRICK SHINGLES SUBSTITUTED FOR THE ORDINARY TYPE

The desire of a house owner to utilize brick in every possible manner led to the adoption of a roof constructed entirely with shingles of this material. The shingles are similar in size and shape to the ordinary variety, with the exception of the thickness, which apparently is in excess of the usual. This is due, no doubt, to the brittleness of the material and the ease with which a thin piece would break. They are made from the usual brick material and are molded to any desired form. Apart from the thickness of the shingles, the roof resembles the ordinary roof.



Left: A House in Which Not Only the Walls, but Even the Shingles are Made of Brick. Right: A Pile of the Brick Shingles as They Came from the Yard, like Any Other Bricks Except for Their Shape



This Pump-and-Turbine Unit, When Installed, will Lift 450 Gallons a Minute to a Height of 1,400 Feet. At the Right Is the Steam Turbine, Next Is the Reduction Gear, and at the Left Are the Two Pumps, Connected in Series

BIG PUMP-AND-TURBINE UNIT BUILT FOR AMERICAN REFINER

A large pump-and-turbine unit recently completed for a California refinery, is, according to report, of a type represented by only two earlier installations, one in Switzerland, and one in America. As bolted to the long base, the unit consists first of a four-stage, condensing, high-pressure steam turbine rated at 4,200 r.p.m. Directly connected to the turbine is a reduction gear. Next come the two pumps, arranged in series, and driven from the reduction gear. Their power is suggested by the fact that they are designed to raise 450 gal. of water a minute to a reservoir in the California mountains, 1,400 ft. above the intake.

CONCRETE HEATING STOVES SAVE FUEL

A German inventor has attacked the fuel-shortage problem by developing a reinforced-concrete stove to be used for either cooking or heating purposes. All the conventional stove fitments, oven, reservoir, hot plate, etc., are incorporated. Although, of necessity, heavier than those of iron or steel, the concrete stove is portable. Owing to large plane surfaces, and the inherent heat-insulating properties of concrete, the new stove is claimed to be unusually economical.

¶Smoke bombs dropped from airplanes are likely to be an important factor in the future provision of smoke screens for the concealment of naval vessels. Recent tests with 50-lb. bombs appear to indicate that those used in actual warfare should weigh 100 lb. or more.

COLOSSAL SANTA CLAUS BUILT BY DEPARTMENT STORE

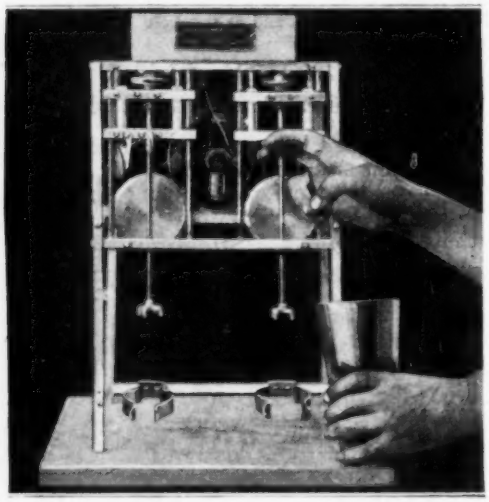
The jolly Christmas saint has seldom been memorialized so heroically as in a large department store during last year's holiday season. Standing 24 ft. tall, on the main floor, the promising twinkle in

This Huge Santa Claus, 24 Feet Tall, Was the Focus of Childish Interest in a Large Department Store During Last Year's Christmas Season

his eyes immediately fascinated every small boy and girl who entered the doors. The colossal figure was fashioned of wood and steel, and adorned with the conventional fur-trimmed uniform and bulging pack. A full-grown person could walk upright between the legs. The face was cleverly fashioned of papier-mâché.

ELECTRIC DRINK MIXER STIRS TWO OR MORE AT A TIME

Electric drink mixers, as ordinarily constructed, have an individual motor for each stirring spindle. Now an Indiana



A Double Drink Mixer with a Single Motor, Which Rotates the Stirring Spindles by Friction Drive

inventor has devised one in which a single motor drives two or more vertical friction wheels, and each stirring spindle carries a small friction wheel at its upper end. When the stirring end is lowered into the beverage by means of a finger hook, the wheels engage, revolving the spindle so rapidly that the drink, or as many of them as there are spindles, may be thoroughly mixed in 10 seconds.

AUTUMN FORESTS MAPPED BY AEROPLANE

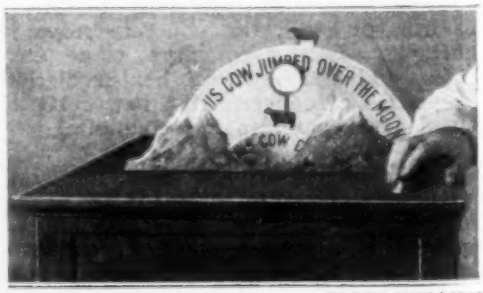
The experiment of surveying and photographing large forests by aeroplane has resulted in the discovery that when this work is done in the autumn, the decided colorings of the foliage disclose the location of tracts of hard and soft woods. This has been found to be of great assistance in mapping forests.

OBSERVANT FLIERS IN IOWA DISCOVER HIDDEN STILLS

For revealing details hidden from horizontal observation, the value of the "bird's-eye" view was demonstrated anew in Iowa not long ago. The attention of a flier, circling about near Des Moines, was caught by various ribbons of smoke, arising from apparently deserted regions, and closer inspection revealed a number of autos hidden in the brush. When the airman returned with a companion and made a landing, a large copper still was discovered, attended by four men, and fed with corn from a wagon. A little later a second similar illicit enterprise was found in the same way. Notification of the authorities was followed by a successful raid.

"THE COW AND THE MOON," A MODERN APPLICATION

A clever exhibition device has been designed to drive home a realization of what is being accomplished along the line of breeding for special purposes. The apparatus forms part of a highly interesting exhibit by the dairy division of the Department of Agriculture. By the pressure of a button the likeness of a cow is actuated, electrically, to make the high jump, marked "This Cow Jumped over the Moon," or the low jump, marked "This Cow Didn't," depending upon whether the animal in question equaled or fell below a certain minimum yield requirement. In order that a cow be credited with ability to compete in the high jump she must show a yield record of from 30,000 to 33,000 lb. of milk, of a specified butter-fat content, per year. The record of 33,425.2 lb. is held by "Tilly Alcartra," property of a western stock fancier. This is, of course, a phenomenal yield and is not to be expected of every animal.



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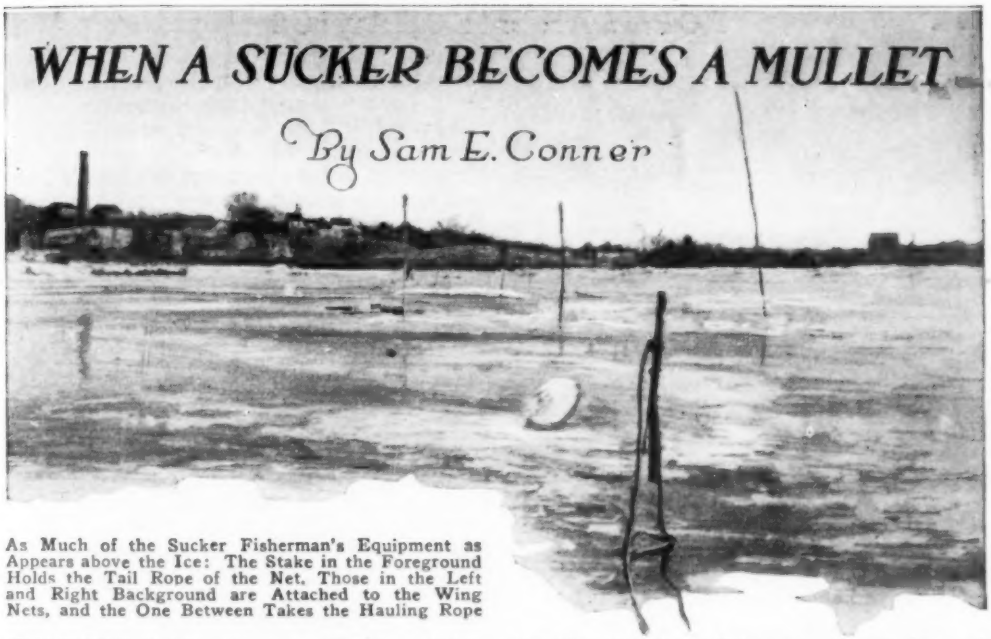
Exhibition Device Used to Illustrate the Difference in the Milk-Production Records of Cows

WHEN A SUCKER BECOMES A MULLET

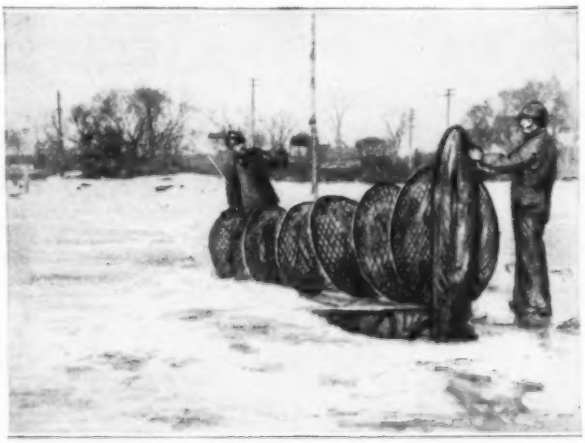
By Sam E. Conner



As Much of the Sucker Fisherman's Equipment as Appears above the Ice: The Stake in the Foreground Holds the Tail Rope of the Net. Those in the Left and Right Background are Attached to the Wing Nets, and the One Between Takes the Hauling Rope

SUCKER fishing is a profitable winter industry in parts of Maine. The fish are shipped by the ton to New York, where they are regarded as a delicacy by many. In the big city the fish are not called suckers, but become mullet. While suckers are shipped from several places in Maine, the center of the industry is at Bowdoinham on the Cathance River.

The fishing season begins in October and closes in April. A sucker is good eating only during months when the water is cold. At this season their flesh is firm and hard, at all other times flabby. The flesh has a sweet taste, which, while appealing to those accustomed to it, does not usually please on first trial.



One of the Peculiar Nets Used by the Sucker Fishermen: They Are Round, with a Point at One End and a Six-Foot Mouth at the Other, and Are About 18 Feet Long

Shipments from Bowdoinham average about 100 tons a season. Fishermen receive from $7 to $12 per 100 lb. for the fish, although during last winter the prices varied from $7 to $20. An average price for the past seven years would be about $9.50 per 100 lb., or $190 a ton. On this basis, the annual return to the Bowdoinham fishermen for their work during these seven years has been approximately $19,000. So far as Maine is concerned, the sucker fishery is worth while.

The fish are taken in nets, known as pike nets. They are round, pointed at one end and tapering to about 6 ft. in diameter at the mouth, and about 18 ft. long. From each side of the mouth extends a wing net, 6 ft. deep and 30 ft. long. These wings are weighted at the bottom so that they will hang perpendicularly in the water. The net is set under the ice, its mouth some 12 ft. back from the hole through which it is hauled. A tail rope, leading from the small end and brought up through a small hole in the ice, where it is made fast to a stake, keeps the net in position. The wing nets are carried away at an angle of 45° to other stakes, thus forming a tunnel, the mouth of which is about 50 ft. across, which leads directly into the main net.

The fishermen usually work in pairs,

Hand Nets, Stoutly Constructed, are Used for Dipping the Captured Suckers from the Live Boxes in Which They are Kept, and Transferring Them to Cases for Shipment to Market as Mullet

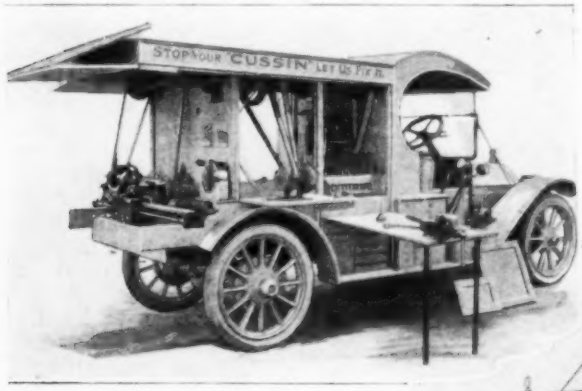
each pair handling four nets. These are hauled in once every 24 hours, at low water. In the opening and closing days of the season it is necessary to use boats to visit the nets, but after the river freezes the work is much easier. As high as 800 lb. of suckers have been taken from a single net at one time. This was an unusual catch, however. As a rule when the nets yield 100 lb. each per day, it is regarded as excellent, while an average of 50 lb. per net is called satisfactory.

For keeping the fish alive until shipping time containers are made by perforating the side of a barrel or big dry-goods box and sinking it in the water near the nets. During the season shipments are made daily.

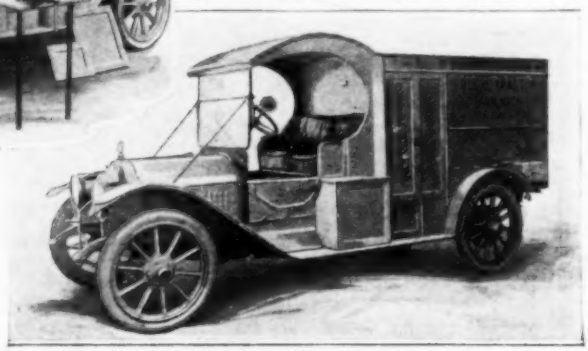
Dumping the Catch from a Net into the Live Box: Despite Its Size, the Net is Easily Handled by the Hoops Which Support It at Intervals

REPAIR SHOP TRAVELS WHERE SERVICE IS NEEDED

Properly to care for the repair needs of autos, tractors, stationary engines, and farm implements requires a fully equipped machine shop, yet the machines most in need of such service may be in no condition to make the trip to town. Recognizing this fact, an auto mechanic of southern California has fitted up a motor truck with a complete repair outfit, including an 11-in. lathe, a drill press, an acetylene welding set, and a full complement of grinding wheels, taps, dies, and other tools. An engine of the vintage of 1910 drives the truck, and furnishes power, through a special clutch, for the machinery. Hauling a trailer fitted up as a comfortable living apartment, the mechanic and his helper, with their wives, travel from ranch to ranch, always busy



The Shop Open for Business, with the Machinery Running and the Well-Arranged Tool Compartments Ready to the Worker's Hand



In Its Traveling Form: The Shop Closed, but Bearing the Advertisements of Its Service Where No Prospective Customer can Miss Them

with repair work and sometimes engaged for months at a time on a single ranch. The proprietor of this ingenious enterprise reports himself well pleased with the results of his unusual venture.

NEW ALLOY RESEMBLING GOLD RESISTS CORROSION

Possessing the color and appearance of nine-carat gold, a new alloy recently exhibited in England also has the property of resisting corrosion from chemical fumes or sea water. It has the ductility and malleability of its precious counterpart, and a tensile strength of 20 tons per square inch. It may be rolled, drawn, wrought, or cast with excellent results.

PLAN NEW YORK SUBWAY NEEDS FOR NEXT QUARTER CENTURY

Based on an expected population of 9,000,000 in New York City 25 years hence, and on a consequent traffic of 5,000,000,000 passengers a year on rapid-transit systems, engineers have recently completed plans for the subways and trackage necessary to accommodate that increase. The cost of the proposed improvements, at present prices, is estimated at $350,000,000. An addition of 830 miles of single track to the existing 616 miles is contemplated, including an eight-track, double-deck trunk line under Eighth and Amsterdam avenues, so designed that four tracks can be built any time and the other four added later. This line will connect at both ends with branch lines, four of them going into Brooklyn, and others traversing Queens, the Bronx, upper Manhattan, and other tributary districts. It will make close connections with the railroad terminals and the tunnels from New Jersey. Another trunk line, under Madison Avenue, will be six-track part of its length, and four-track in other parts. Numerous extensions of existing lines are also planned. To connect the Bronx, Brooklyn, and Richmond with Manhattan, 21 new two-truck tunnels will be ultimately necessary.

FIRE-DRILLMASTER SIGNALS WITH ELECTRIC HORN

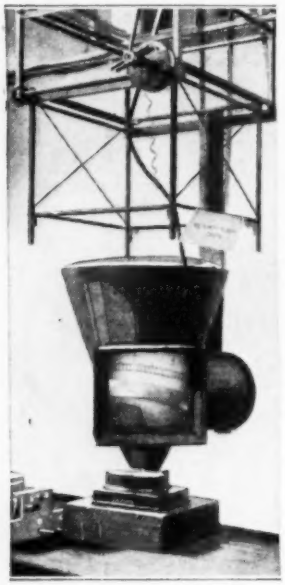
In giving orders to men at work atop a practice tower, the drillmaster of the Los Angeles fire department uses an electric horn. This facilitates his work by relieving him of the necessity of wearing out his lungs shouting through a megaphone. The instrument is mounted on a box placed at one side of the life net, and is operated by means of a switch attached at the end of a light cable. A simple code of signals, requiring no special effort to memorize, is ample for the purpose, and the sharp, staccato blasts of the horn give little opportunity for any misunderstanding of the drillmaster's orders.

The Drillmaster Issues Orders to the Men Above by Sounding the Electric Horn in Accordance with a Code of Signals

¶A new form of infantry-pack buckle has recently been approved by the War Department and will immediately be adopted as part of the infantry equipment. The new buckle was demonstrated to be more easily adjusted than the one now in use.

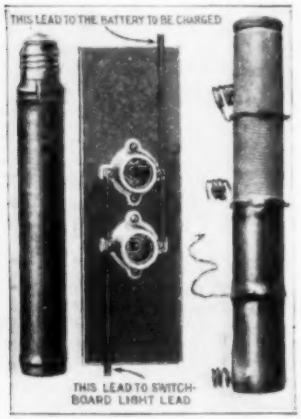
MAGNIFYING INSTRUMENT DIAL REDUCES EYE STRAIN

Finding himself bothered with eye strain, a laboratory observer in the Bureau of Standards evolved a device for magnifying the instrument scale five times. A lens is placed at the bottom of a cone-shaped metal housing, and by a carefully worked out arrangement the image is reflected by means of a mirror onto a ground-glass screen set in a shadow box. The apparatus is suspended from an overhead frame and can be quickly adjusted to display the reading of any instrument on the table below. The device can also be rotated through 90° for taking readings from vertically mounted instruments.



RESISTOR UNITS ELIMINATE LAMP BANKS FOR CHARGING

When charging storage batteries from direct-current mains, it has always been necessary to install a lamp bank between the source of current and the batteries to be charged, to provide suitable resistance. There are many reasons why lamp banks are unsatisfactory for this purpose, and hence a special resistor unit has been developed, which is screwed into a receptacle in the circuit in the same manner as a lamp. The resistor has a capacity of 160 watts, five amperes, and about 6½ ohms, the resistance material being imbedded inside a vitreous covering. Such units are also well adapted for use in radio work, and wherever a load resistance of any kind is necessary.



CADMIUM AS A SUBSTITUTE FOR ZINC IN GALVANIZING

It would seem that cadmium, although being of the same group, would, owing to higher cost, be prohibitive as a substitute for zinc in any process. However, the French bureau of inventions has developed a method of galvanizing, by which, on account of the extreme lightness of the coating, the costs are held to a figure which compares favorably with the costs of the zinc process. Cadmium, being less affected than is zinc by damp air, mildly acid or alkaline solutions, forms, it is claimed, a more durable coating. The fact that it is quite ductile and thin makes it possible to bend and form the coated article to any desired shape without running the risk of breaking the coating.

NEW WINDSHIELD CLEANER IS ELECTRICALLY HEATED

The inventor of a new windshield cleaner for automobiles and street cars provides means for melting snow and ice adhering to the outer surface of the glass. The cleaner is in two parts, the outer of which is connected to a source of current for melting ice and snow, while the inner one removes moisture condensed from the breath.

¶Transfer of a motorized battery of French "75s" from Camp Knox, Ky., to Camp Benning, Ga., with five-ton tractors, three-ton trucks, and field-artillery reconnaissance cars, is being made the occasion of a practice march, the first of its kind in this country. The route is 600 miles, through mountainous country, with close observance of war conditions.

FALLEN MONARCH OF CALIFORNIA FOREST A SHELTER FOR HORSEMEN

"MARY WASHINGTON," so described, is one of California's fallen forest monarchs, and of all the huge conifers, fallen or yet standing, this is one of the largest. A dozen horsemen and their mounts can find shelter under the huge roots and in a cavity on one side, which has rotted away so that there has been formed a natural shelter of enormous proportions.

CONVOY OF DOG TEAMS HAULS SUPPLIES OVER YUKON TRAILS

WHERE railways are nonexistent and roads exist, if at all, in a very rudimentary stage of development, the going is rough even under the best of conditions. However, in the winter, when passage by water is impossible, and the trails are deep-drifted with snow, all transportation in the Yukon Valley is by means of dog sledges. Both the United States and Canadian governments are building railroad and telegraph lines to link up the interior of Alaska with the outer world, and the transportation of supplies to the employes during the winter keeps the authorities occupied. One such convoy of supplies which went into the wilderness, for the telegraph employes, was made up of 23 dog teams, together with their loads and attendants.

FEDERAL HUNTERS RID TEXAS OF PREDATORY ANIMALS

The business man who looks forward eagerly during the entire year to a week or two of hunting in the fall may well envy a number of Texans who hunt day after day, in season and out. These men are professional huntsmen in the pay of the government; and it is said that they have done more in the last few years to check the ravages of predatory animals than the ranchmen had accomplished, unaided, in the preceding half century. Unlike the ranchmen, too, the Federal hunters employ few traps and dogs, choosing to place their main reliance on the rifle. The efficiency of their methods is indicated by the report that to date they have saved the stockmen millions of dollars.

One of the Government Hunters Sitting, Rifle in Hand, behind a 140-Pound Mountain Lion Killed near Sheffield, Texas, in the Course of His Day's Work

MAKING PEARLS FROM FISH NEW DOMESTIC INDUSTRY

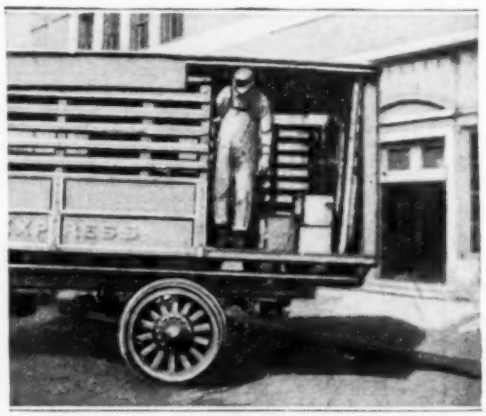
Establishment of a new eastern factory with 50,000 sq. ft. of floor space, for the manufacture of artificial pearls from fish-scale essence, marks the beginning of a new American industry, formerly dependent on imports from France, Germany, and Italy. The common herring is the base of supply for the iridescent material used, and removing it is an arduous task, because each scale, taken only from certain parts of the fish, yields but a tiny speck of luster. The essence so collected is used to coat solid glass beads, which are then baked, burnished, and coated again, sometimes as many as 20 times. In the French method hollow beads are used, the iridescent coating being applied on the inside.

CIRCLE OF GLOBE COMPLETED BY TRANSPORT "AMERICA"

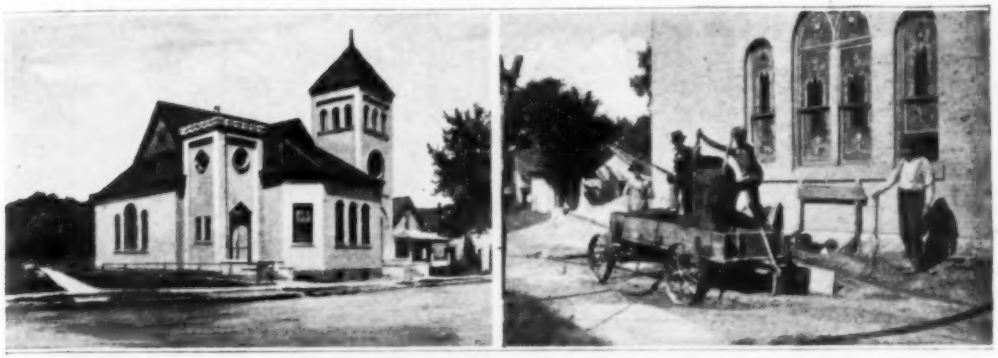
After an absence of 167 days, the U. S. transport "America" recently returned to American waters in excellent condition, having completed a 29,043-mile trip around the world in an actual sailing time of less than 100 days. Some of the longest laps of the voyage were New York to Colon, 1,973 miles, made in six days; Balboa to San Francisco, 3,251 miles, in 11 days; San Francisco to Manila, 6,350 miles, 21 days; Vladivostok to Hongkong, 1,645 miles, five days; Colombo to Suez, 3,410 miles, 11 days; Trieste to Gibraltar, 1,710 miles, five days; and Gibraltar to Norfolk, Va., 3,350 miles, 10 days. From Vladivostok 6,500 Czecho-Slovak troops were carried to Trieste.

SIDE-DOOR TRUCKS CAN LOAD DIRECTLY INTO CARS

Because of the congestion in a western railroad yard, motor trucks used in express service are being converted from rear-door to side-door form. Thus arranged, the trucks are enabled to run between standing lines of express or freight cars, and load their contents directly into the car doors with a minimum waste of time, space, and labor.



Express Truck with Its Doors in the Sides, Permitting Direct Loading into Railroad Cars with a Minimum Waste of Time and Effort



Left: The Remodeled Church as It Appeared After It had been Refinished with Stucco and Provided with a Basement. Right: The Church's Pastor and Some of His Congregation Excavating the Earth from Underneath the Building for a Basement

PASTOR AND COMMUNICANTS REBUILD IOWA CHURCH

Standing as an enduring monument to the energy and devotion of its pastor and congregation, a weather-beaten Iowa church was rehabilitated inside and out, and enlarged to meet the demand for additional space. The building had no basement, and rather than build surface additions, for which there was insufficient room, it was decided to build a basement. The earth was removed from under the building, a little at a time, and as this was done, short sections of concrete wall were put in to support the building. The outside of the structure was refinished with pebble-dash stucco. As a result of the pastoral labors, the church now has ample floor space and is equipped to meet all demands of the congregation.

SHOE DEALERS HAVE BOOTS FOR ALL SIZES OF FEET

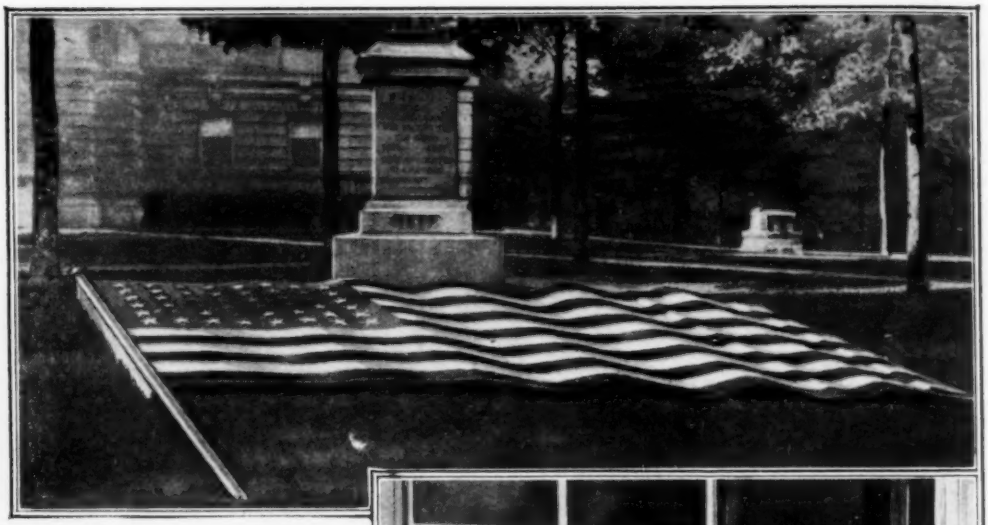
A recent convention of shoe dealers in Denver was characterized by the exhibition, among other kinds of footwear, of some remarkable rubber boots. One of the boots was sufficiently large to fit the biggest giant of the story-book tribe, while some others would have equipped the smallest of small Tom Thumbs for a fishing or hunting trip. The boots were made to advertise an eastern product.

HYDRAULIC PRESSURE GAUGE RECORDS VOLUME OF WATER

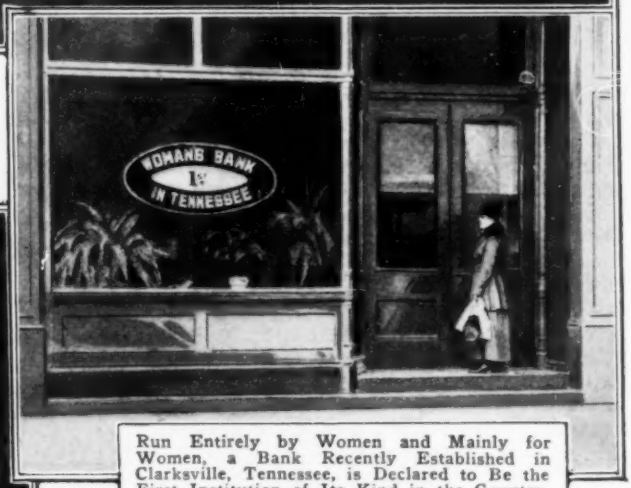
Engineers of a great western hydroelectric power plant have originated an instrument for determining the volume of water flowing through the turbine penstocks. The device is operated by the water pressure within the pipe, and by considering the diameter of the pipe and its relation to the pressure, the volume is read from a scale on the instrument. All the conduits about the plant have been tapped and provided with suitable connections for the attachment of the recorder. The instrument is of particular value late in the summer when the water supply begins to fall below the normal.

A Recording Pressure Gauge Which Indicates the Volume of Water Flowing through the Turbine Penstocks of a Large Western Hydroelectric Company

CIVIC FEATURES THAT PROMOTE THE COMFORT



An American Flag That will Endure Forever Lies on the Side of a Knoll in the Courthouse Square of Kankakee, Illinois. It is Made of Concrete, with a Metal Staff, and Measures about 8 by 15 Feet. The Painted Colors are Easily Renewed



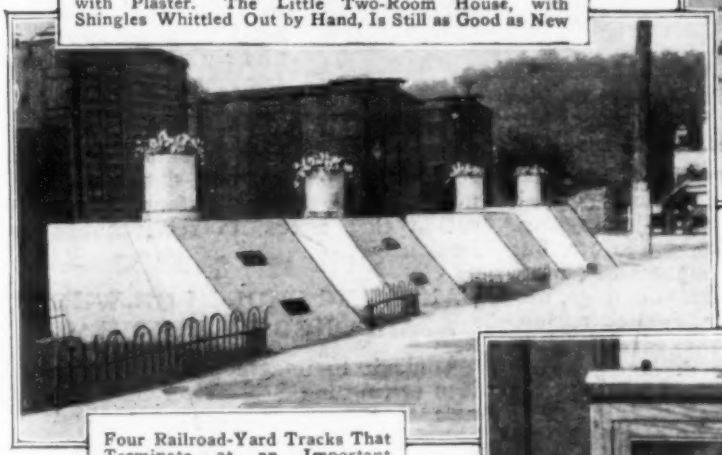
Run Entirely by Women and Mainly for Women, a Bank Recently Established in Clarksville, Tennessee, is Declared to Be the First Institution of Its Kind in the Country. There Are No Men Even on the Board of Directors

First-Aid Kits Mounted on Posts along Highways Leading into Pomona, California, Not Only Offer Help in Case of Accident, but Act as Deterrents to Careless Driving

Motorists must Follow the Curve Marked on the Pavement, When Turning This Heavy-Traffic Corner in San Francisco, and the Space between the Parallel Lines Is a Safety Zone for Confused Pedestrians

One Wall was Saved, and Considerable Room Gained, When a Pioneer Homesteader in Southern California Built His Cabin, 45 Years Ago, against the Deeply Concaved Face of a Huge Bowlder, Sealing the Joint with Plaster. The Little Two-Room House, with Shingles Whittled Out by Hand, Is Still as Good as New

Conventionalized Seals, Done in Cement, Form the Motif of the Amber-Shaded Street Lamps of Seal Beach, California



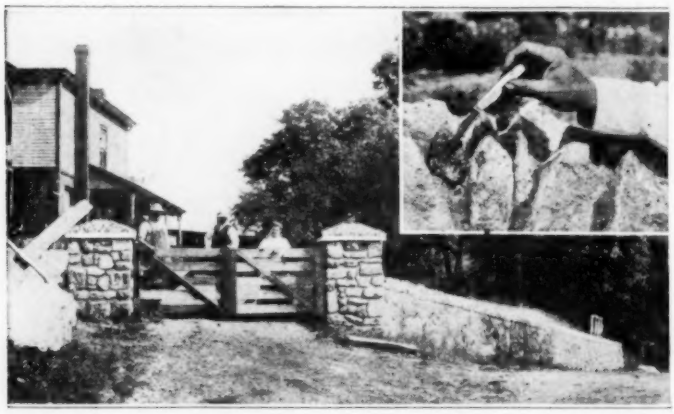
Four Railroad-Yard Tracks That Terminate at an Important Street of Ashland, Kentucky, have been Equipped with Concrete Bumpers, Painted White, and Surmounted by White Tiles Filled with Flowers

When Any Article is Lost in Bar Harbor, Maine, the Owner Is Very Apt to Find It on Display in a Glass Case on the Main Street. Anything Too Large for the Case is Described in a Bulletin. The Scheme, Originated by the Police Department, Is Very Effective

At Night Lamps Burn Continuously behind Red Bull's-Eyes in the Fire and Police-Alarm Boxes of Monrovia, California, So That They are Always Easily Found in an Emergency

FARMER BUILDS AN IRON-ORE FENCE AROUND HIS HOUSE

Fortunately, for the scenic effect, a rural owner of an iron-ore deposit built a wall around his home of the virgin ore instead of waiting until the ore was melted and defacing his premises with one of the hideous fabricated-iron fences. The wall proper is of low-grade ore, but the top is composed of nuggets of almost pure metal. The ore from this mine, unlike that from the Lake Superior region, is dug from deep in the earth and is brought to the surface in black, heavy chunks.



A New York Farmer, Made Prosperous by the Discovery of Iron Ore on His Land, Found Time Heavy on His Hands, So He Built a Wall of Iron Ore around His House. The Insert Shows the Coallike Appearance of the High-Grade Mineral

LIGHT PLYWOOD AUTO BODY IS ONE-EIGHTH INCH THICK

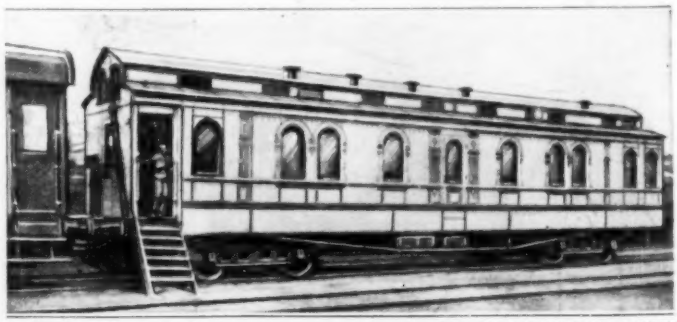
Special glues developed for airplane construction now make possible the fabrication of plywoods that are highly resistant to water, vibration, stresses, and even impact. Adapting this material to automobile construction, a five-passenger sedan body has been built, for a car of 112-in. wheelbase, weighing only 120 lb. It is of three-ply veneer, the inner layer mahogany and the outer ones of birch, the whole being but 1/8 in. thick. Great strength is contributed to the structure, which is built on the principle of an airplane fuselage, by the crossed grains of the plies of wood.

TALKS WITH MAGNIFIED VOICE FROM LAND TO SHIP

Magnified perhaps a million times, as an ultramicroscope magnifies a visual image, a mighty human voice recently rolled forth from a 10th-story window in a New York office building. It pulsated over the city, outvibrated the raucous sounds of a busy waterfront, and sounded loudly and clearly in the ears of those aboard a big passenger ship passing down the North River toward the Narrows, on the way to England. The huge voice then gave way to a musical selection, and that, projected through space in the same manner, also was distinctly heard. It was a triumphant test of a loud-speaking telephone recently developed, and demonstrated a new method of long-distance communication that needs no receiver but the human ear.

FANTASTIC CHURCH ON WHEELS ABANDONED BY BOLSHEVIKI

Difficult to imagine in a sober American setting is the bizarre religious structure that once fell into the hands of an anti-Bolshevist force operating near Lake Baikal, Siberia. Formerly a railroad coach of the better type, the car had been done over in elaborate style. The interior was crowded with hangings and other churchly appurtenances; the exterior was strikingly adorned with rococo woodwork painted in half a dozen colors.



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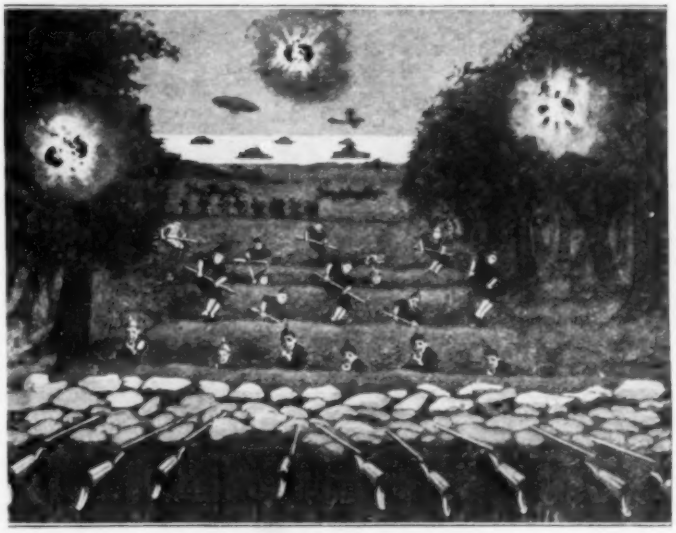
The Bolshevists Abandoned This Fantastic Church on Wheels in the Course of a Minor Retreat near Lake Baikal, in Siberia. The Photograph Fails to Suggest the Many Hues of the Exterior

"SQUAREHEAD" ATTACK REPELLED ON NEW RANGE

Representing a battle scene in the recent unpleasantness with the Germans, a rifle range has been built up, in which the marksman repels the attack of a raiding party—if he is a good shot. The human figures as well as the airplanes, artillery, and other accessories, are operated with a splendidly realistic effect of motion by a fractional-horsepower electric motor. The defender, in the person of the marksman, shoots at the oncoming "squareheads" from behind what would be a substantial trench in active service. Regular .22-caliber target rifles are used on the range.



Whether the Marksman behind the Trench in This Latest of Shooting Galleries Successfully Kills Off His Quota of Germans or Not, the Practice will Help to Sustain America's Well-Deserved Reputation as a Nation of "Dead Shots"

TOOL SIMPLIFIES INSERTING PISTONS INTO CYLINDERS

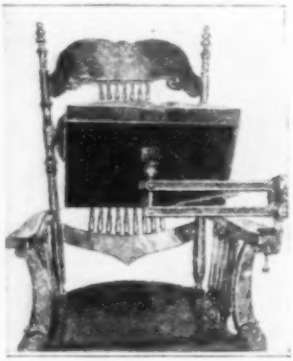
One of the motor mechanic's bugbears has always been the insertion of a piston into its cylinder, owing to the fact that the piston rings must be compressed to enter. A simple tool, recently devised for the purpose, is made of a flexible strip of metal which can be adjusted to the size of the piston. In use, the tool is put around the piston, with the rings in place, and pushed into the cylinder. The operation is completed by pressing down on the piston.

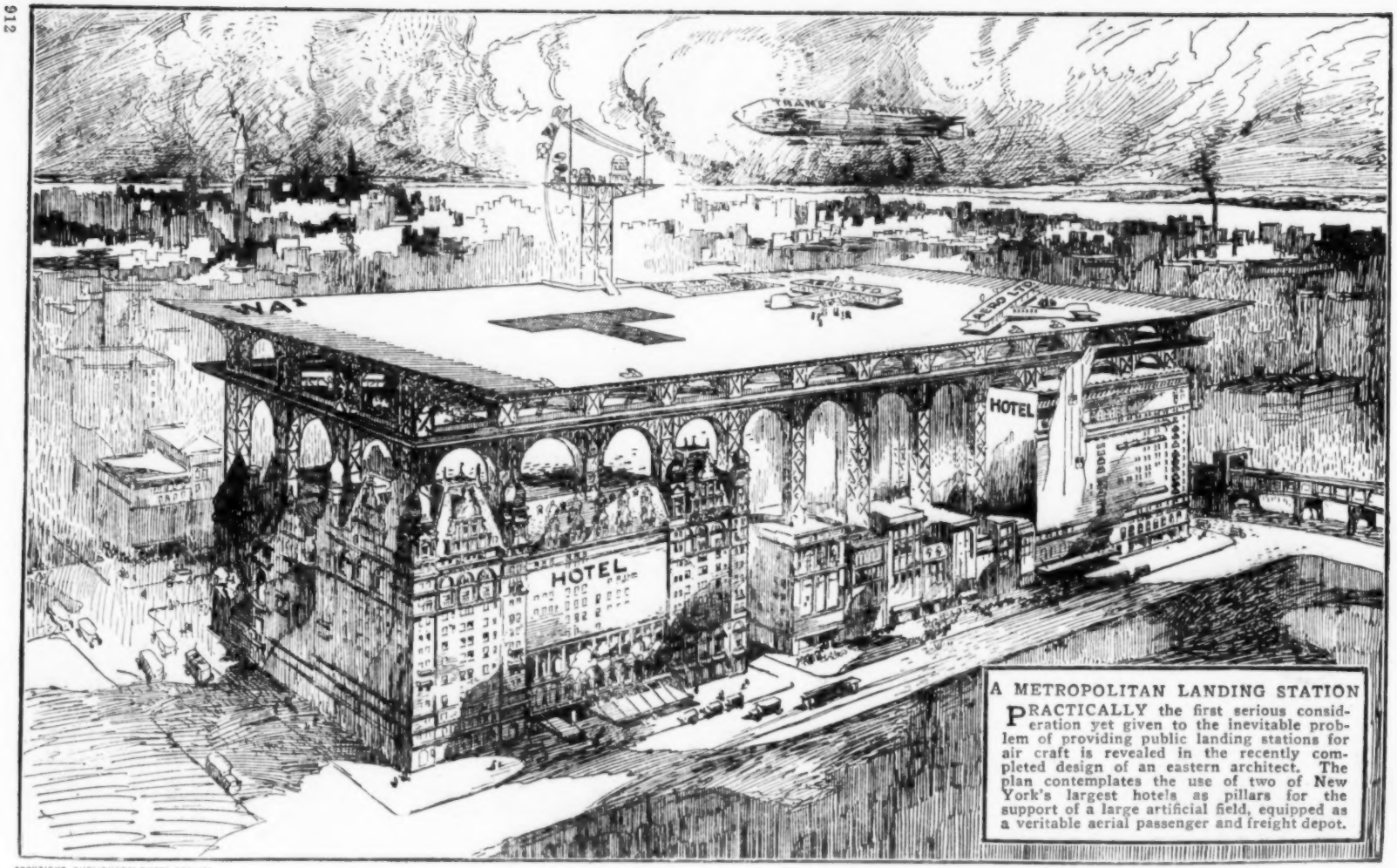
PHOTOELECTRIC COMPOUND IS HIGHLY SENSITIVE

By combining thallium, oxygen, and sulphur, an American chemist has evolved a new substance with photoelectric properties declared to surpass those of selenium. Melted and inclosed in vacuum tubes, to prevent oxidation, the compound changes its electrical resistance on exposure to light, with a sensitivity so great that it is necessary to use glass of a certain red tint in order to screen out the blue and ultraviolet rays, which affect it harmfully.

BOOK HOLDER ATTACHABLE TO CHAIR OR DESK

Of particular convenience in the library or office is a recently marketed book holder which can be attached to any chair by a simple clamp. The device is adjustable angularly within 90°, can be swung to the right or left, and has a range of 18 in., in vertical adjustment, which makes it possible to have a book in the most convenient position. The holder can also be attached to the edge of a desk for supporting reference works or manuscript, leaving the desk clear.





A METROPOLITAN LANDING STATION

PRACTICALLY the first serious consideration yet given to the inevitable problem of providing public landing stations for air craft is revealed in the recently completed design of an eastern architect. The plan contemplates the use of two of New York's largest hotels as pillars for the support of a large artificial field, equipped as a veritable aerial passenger and freight depot.

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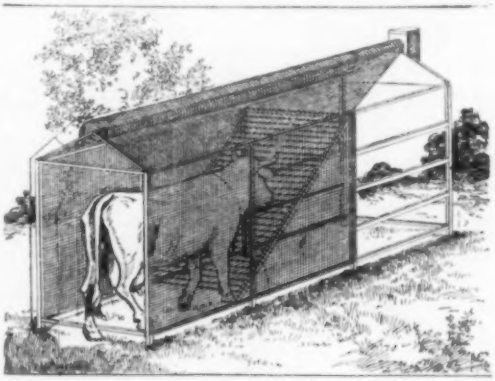
OIL FLOW IN PIPES COMPUTED BY SIMPLE SLIDE RULE

Oil flow in pipes cannot be figured with the customary hydraulic formulas, because of the element of viscosity, and its complement, mobility; properties that vary with each grade of oil. Account was given in this magazine last August of a special slide rule, designed to simplify the computation of fluid flow in pipes. From this instrument now has been evolved a similar device for solving the complexities of oil flow. Accompanied by temperature and viscosity charts, the new slide rule indicates the loss of head in pipe lines, the proper diameter of pipe to be used, the discharge, and other problems peculiar to the material. It is made in 12-in. size, of white celluloid.

ODD FLYTRAP IS DESIGNED TO KEEP COWS CONTENTED

Along with keeping his hired help contented the farmer must also keep his cows "contented," if they are to give their maximum production of milk. A Kansas farmer, who believes that bovine contentment depends largely upon keeping the animals free of flies, has invented an odd flytrap for that particular purpose. The cow enters and walks through the cage, and the flies are brushed off by brushes that protrude from each side. The flies, or most of them, in their attempt to escape, are caught in a specially designed trap on the top of the inclosure.



A Special Flytrap, the Invention of a Kansas Farmer, Brushes Flies from Cows and Imprisons Them in a Trap at the Top of the Contrivance

SIGNAL FIRES ON THE DESERT

BY J. CECIL ALTER

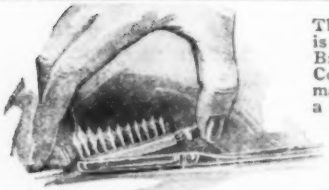
SIGNAL fires or lights continue to send Paul Reveres on important rides and movements over the thinly settled parts of the West where telephone or other communication lines are not available, yet quick communication is frequently necessary. They are often the means of communication for the hunter, the freighter, the sheep herder, the cow puncher, the homesteader, or other lonely westerner calling for assistance, or for sending a message, on a prearranged plan, or in a simple code.

In an earlier day, signal fires were a great aid to the long trains of settlers going over unbroken country into many of the flourishing valleys of today. When 80 wagons and 225 persons struggled for many weeks along a wretched trail to reach extreme southeastern Utah for its initial colonization, many routes were tried—and most of them found wanting. At one place, two routes were available, and sometimes one of these was impassable at a point many miles ahead. Hence decision was necessary at the diverging of the ways.

Three signal fires were maintained every evening, practically 25 miles ahead, on the western slope of Elk Mountains, which could be seen from the forks in the route. Two fires were in line of sight, being separated by their difference in altitude, and forming the base of the triangle. The third fire was placed to the north or south to indicate the route to be selected by the travelers for best progress.

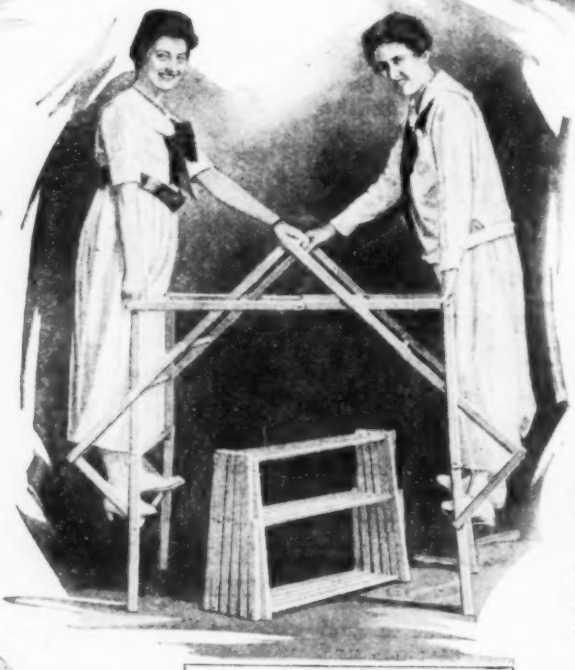
One of the commonest present-day uses for signal fires, and one which cannot soon be replaced by any other system, because heliographic instruments cannot be maintained for lack of permanent residents, is in signaling across the Grand Cañon of the Colorado, in Arizona. Tourists, hunters, and business men often arrive at the north rim, usually on only an approximate schedule because of the remoteness of the region. Guides, pack animals, and cable or ferry tenders must then be called from the opposite side, 12 or 15 miles distant across the abyss. The signal fire is the best method at present, and the inquirer awaits the reply before starting on the daylong and hazardous journey into the depths of the cañon, for the purpose of meeting those requested at the cable crossing or the ferry.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



The Toothbrush at the Left is So Constructed That Its Bristles, Set Firmly in a Composition of Aluminum, may Easily be Removed as a Unit, and Quickly and Thoroughly Sterilized

A Pencil Holder with a Tiny Gasoline Torch at One End, Seen Above with Its Metal Striker Removed, Gives Light to Write by, or a Blaze for a Cigar

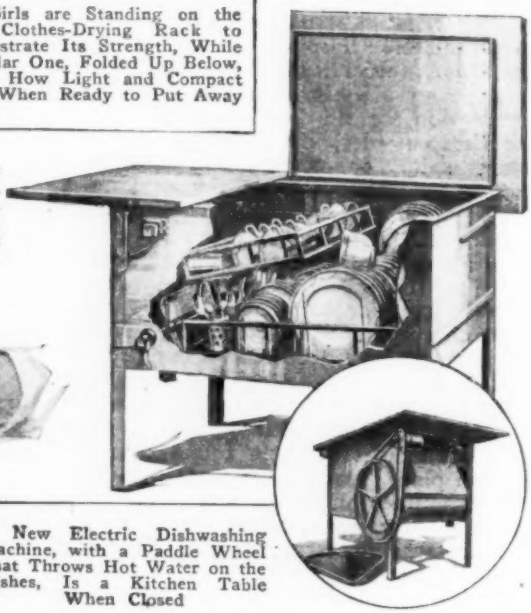


The Girls are Standing on the New Clothes-Drying Rack to Demonstrate Its Strength, While a Similar One, Folded Up Below, Shows How Light and Compact It Is When Ready to Put Away

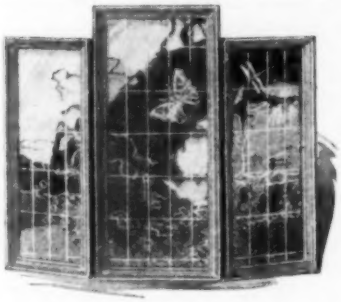
Perforated Metal Disks in These Electric Water Heaters Pass the Current Directly through the Water, Heating a Tubful Very Quickly

A New Kind of Breakfast-Food Carton Has a Perforated Window in One Side, Much Easier to Open than the Sealed Ends

Instead of a Big Cedar Chest for Clothing, a Little One, Six by Three Inches, is Now Made, Containing a Can of Cedar Scent That Is Adequate for a Whole Clothes Closet



A New Electric Dishwashing Machine, with a Paddle Wheel That Throws Hot Water on the Dishes, Is a Kitchen Table When Closed



It has Become the Fashion to Hide the Home Telephone, and the Little Screen at the Left, Done in Bright Colors on Parchment Paper in a Frame of Burnished Gold, Does It Most Daintily

A Bug Screen below the Shade Is the Feature of a New Porch, Lawn, or Garden Lamp, That Makes Its Own Gas, and Gives 300 Candlepower

A Simple Vegetable and Fruit Press of Only Three Parts, as Above, Clamps to the Table, and may be Folded, as Below

A Diminutive Electric Range, Only 15½ by 8½ Inches on Top, That Connects to Any Lamp Socket: A Double Element in the Oven Permits Four Cooking Operations at a Time, and After Current is Turned Off, the Oven Acts as a Fireless Cooker

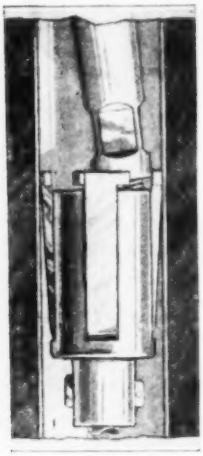
A New Wire Strainer That Stands Alone on Wire Legs in a Dish That Comes with It, Instead of Having to be Held in the Hand

Hanging Clothes on a Pulley Clothesline is Made Easy and Safe by a Window-Frame Attachment That Temporarily Extends the Line inside the Window

Pulling Straws Out of the New Broom to Test Cakes Is Unnecessary Now, Since Packages of Selected Broom Straws, Put Up in Sanitary Packages, can be Obtained for That Purpose

FISHING TOOL FOR OIL WELLS RECOVERS LOST DRILLS

Drills lost in oil wells, reported to number thousands in the fields of the Southwest, are readily recovered, it is asserted, by an improved fishing tool invented by an Oklahoma man. The tool, which is screwed onto the end of the drill shaft in place of the missing drill, carries four pivoted prongs that guide it over the shank of the lost instrument, and 16 inner radial teeth that grip the metal firmly and enable it to be pulled out of the hole. Holes that are crooked or filled with mud and water are declared to offer no obstacle to the successful operation of the tool.



ADJUSTABLE FRAME HOLDS SAW BLADE OF PRUNING TOOL

Similar in some particulars to a hacksaw, a new tree-pruning tool comprises an adjustable frame, designed to hold a toothed cutting blade. Included in the frame, which is fastened to the end of a 5-ft. pole, are two metal bars, one rigidly attached to the handle, and the other pivoted on the first. The blade is held between the free ends of these members, and tightened by means of a lever. The device weighs only 4 lb. It can be operated by a person standing on the ground, or one stationed in the branches of a tree.

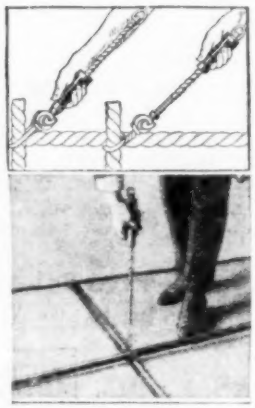
¶A monster gun, 80 ft. long and able to throw an 8-in. shell 70 to 80 miles, is now being built in the armament works at Sheffield, Eng., according to a recent statement of the lord mayor of that city. Provision is made for frequent relining, necessitated by the high projectile velocity.

NEW WATER-VIBRATION SYSTEM USED FOR POWER IN MINES

Rock drills of a new form, driven by the system of water-column vibration described in this magazine last February, have been manufactured and put into service by an English concern. The stationary column of water in the pipe line has a pressure of 100 lb. per square inch, and the wave generator delivers 40 vibrations a second, at 1,500 lb. per square inch, by means of a piston driven by an electric motor or other high-speed power. The drills are hollow, for a dust-laying flow of water, and have a rotating motion.

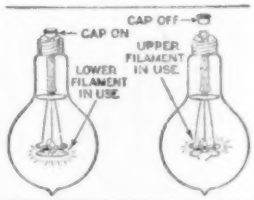
WIRE TIES AND TYING TOOL FOR REINFORCING BARS

The customary expenditure of labor that has attended the tying together of steel reinforcing bars with wire will be reduced by a newly developed method of doing this work. A wire tie with looped ends is used: this is passed around the rods, and the hook of the tying machine is inserted into the loops. The tool operates on the principle of the automatic screwdriver, an upward pull on the handle leaving the wire securely twisted.



DOUBLE FILAMENTS LENGTHEN LIFE OF ELECTRIC BULB

A new electric-lamp bulb, with double filaments, is so constructed that when one burns out, the other is made available by a simple adjustment. Only one filament is used at a time; when the first gives out, the bulb is unscrewed from the fixture and a small metal cap is removed from the lamp base, revealing another contact which brings the second filament into use when the lamp is again screwed into its socket.

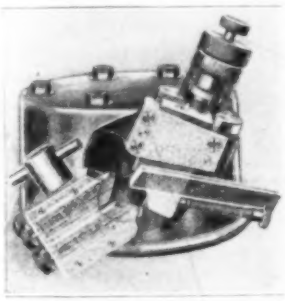


PORCELAIN OF NEW KIND HAS PROPERTIES OF GLASS

Porcelain that can be softened by heat and blown into any desired shape, fused together, or even pierced by an oxyhydrogen blowpipe, behaving like ordinary glass, is now being manufactured in Bavaria. The new product owes its properties to the discovery of a glaze with the same coefficient of expansion as the porcelain itself, the usual failure under heat being caused by the stresses of unequal expansion. The workable porcelain should prove valuable for the manufacture of chemical ware and physical apparatus.

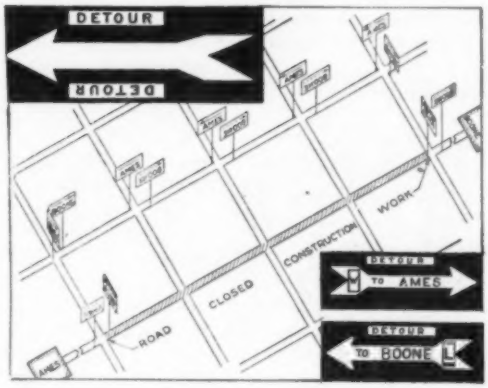
BOX TOOL FOR SCREW MACHINE SAVES TIME AND MATERIAL

The guesswork and vexation entailed in the operation of the ordinary box tool is eliminated in a recently developed device, by means of which the tool bit is adjusted to or from the center of the work to within .0001 in. by a micrometrically graduated adjustment knob. The V-guides are controlled by spring pressure and may be set as desired by a locking stud. When this stud is released, the guides snap down to the surface of the stock, the guides being then securely locked by turning down the locking stud and jaw nuts. This prevents backsliding of the guide jaws. A special tool bit, which has a safety notch at the end to engage with the tool-bit stud nut, is used with the device. This notch provides ready means for quickly inserting and withdrawing the bit, and at the same time guards it against movement when the box tool is in operation.



ARROWS MARK DETOURS ON IOWA'S HIGHWAYS

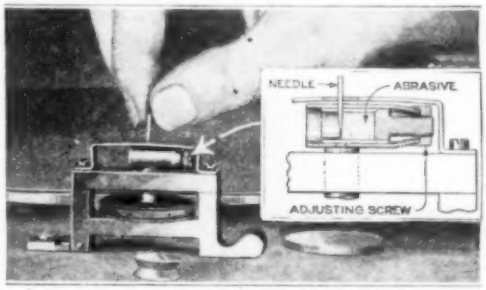
All detours around roads closed to traffic in Iowa are carefully marked for the guidance and protection of travelers. Signs are erected at intervals so that the proper direction can be taken with the slightest deviation from the regular route. The signs, as furnished by the state to the counties, at cost, have a yellow arrow printed against a black ground, with the word "detour" above and below the arrow. When the sign has been placed with the arrow pointing in the proper direction, the "detour" below is deleted with black paint. The name of the place the arrow is pointing to, and other information, is stenciled inside the arrow.



The Blank Sign Furnished to the Counties is Shown in the Upper Corner, and as Used, in the Lower. The Larger Illustration Shows How the Signs are Disposed to Guide Traffic around a Closed Road

MACHINE REPOINTS USED PHONOGRAPH NEEDLES

A small attachment which is fastened to the phonograph with a single screw makes it possible to resharpen worn phonograph needles repeatedly. The device is operated by a friction pulley which bears against the face of the record turntable when the sharpener is in use. The needle is inserted vertically through an opening in the top of the device, and is thus brought against an abrasive sharpening element contained in a revolving grinding tube. The point is sharpened in a few seconds.



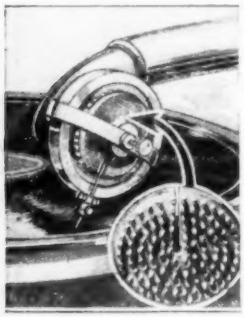
The Resharpening Machine for Phonograph Needles: The Arrow Points to the Adjusting Screw. The Insert Shows the Device in Detail

FUEL GAUGE, LOCK, AND VALVE MOUNTED ON DASH

A new instrument for the convenience of motorists combines in one unit a gasoline gauge, valve, and lock for preventing theft, mounted on the dash so that the driver can at all times determine without leaving his seat just how much fuel he has left. Also, this latest accessory controls the flow of fuel from the tank to the carburetor, and is provided with an approved lock which materially reduces the chances of the car being driven off under its own power without the knowledge and consent of the owner. The device is made entirely of brass and can be applied to any car.

PHONOGRAPH "SILENCER" VARIES SOUND VOLUME

By using a recently marketed attachment which is applied to the sound box of a phonograph, the tone of the instrument may be modulated so that records can be played at any time without disturbing the neighbors. The device consists of a wooden disk faced with closely set rubber projections; this is applied against the reproducer by a light metal clamp having a screw adjustment. By increasing or decreasing the pressure of the screw any desired volume of sound is obtained.

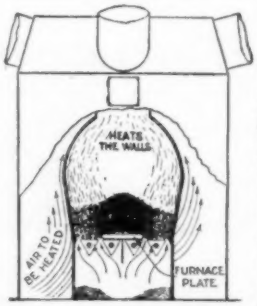


WORK OUT RULES FOR SPEED OF LIGHT SIGNALS

Code signaling with lights was made the subject of a recent study to determine the highest speed of transmission at which reception could be considered reliable, and the relative duration of characters and spaces. It was found that the use of a windowed-disk transmitter, or an argon-filled lamp with a ribbon filament, giving a quick make and break of the light stream, made readable a speed of 9 to 13 five-letter words a minute, errors, when they occurred, usually being due to the observer's failure to see the dots. Regarding the dot as a unit, a dash of four units' duration, and a space of three, were found most effective.

DRAFT DEFLECTOR ON GRATE SAVES FUEL IN FURNACE

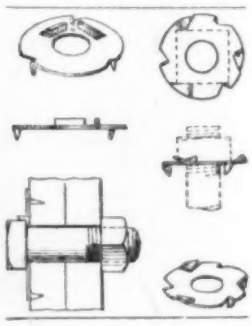
Operating on what is apparently a sound principle, a fuel-saving device for hot-air or water furnaces has been placed on the market recently. It consists of a cast-iron plate which is placed in the middle of the furnace grate to diminish the draft through the center of the fire. In this manner a greater amount of heat is deflected against the furnace walls, and the combustion at the center of the fire is retarded.



LOCK WASHER FOR BOLT NUTS USED WITH WOODEN PARTS

A lock washer has been devised for application to bolts which are inserted in wood, as in farm implements and construction work, to prevent the bolts from becoming loose and backing off.

The washer consists of a simple stamping which is provided with pointed spurs on the back. When the nut is drawn up against the washer the points are driven into the wood, the nut being locked in place by turning up lugs on one or more sides.



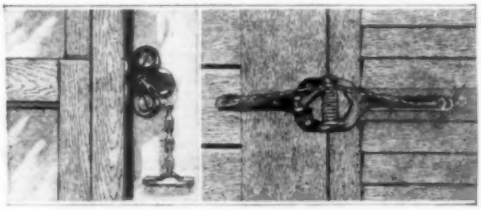
¶Salvaged from the bottom of Tampico Bay, in the Gulf of Mexico, a tank ship was recently towed all the way to a drydock in Brooklyn, N. Y., with a large hole below its waterline closed by a 50-ton patch of cement.

ODD BLASTING SYSTEM USED IN EUROPEAN MINES

In a method now employed in the Nordhausen district of Germany for blasting a heading in a mine, a number of holes are bored, close together, straight into the face of the work, instead of at an angle. Shots are placed in each hole, but a primer and fuse in only one, its concussion serving to set off the others. The resulting small opening is then surrounded by a ring of shot holes, greatly enlarging it, and a third widely spaced circle of blasts serves, as a rule, to clear the face.

DEVICE OPENS AND CLOSES SHUTTERS FROM INSIDE

Most of the objection to wooden window shutters is based on the fact that hitherto it has been necessary to raise the window and expose oneself more or less to open and close them. A recent invention that is intended to overcome



A New Attachment for Window Shutters: A Spring Hinge Keeps Them Shut, and a Short Length of Chain Makes It Possible to Open the Blinds from the Inside without Raising the Window

this objection, includes a spring hinge from which a chain passes inside the house through the window casing; the shutter is normally closed by the hinge, and is opened by a pull on the chain. The latter is provided with a catch which holds the shutter in any position.

CONCRETE BRIDGES IN ASIA SUBMERGED IN FLOODS

Along the coast of French Indo-China are a number of rivers normally consisting of saturated sand, with little flow of water. In flood time, however, they become torrents of sand and water, against which few bridge structures can long endure. Several bridges recently built along the route from Hanoi to Saigon, of reinforced concrete, are of such height that their floors are submerged during the brief flood period. Their usual form is in spans of 10 to 13 ft., with 10-in. piles sunk 20 ft., and a 10-in. deck.

DIRECT-READING MICROMETER NEEDS NO COMPUTATION

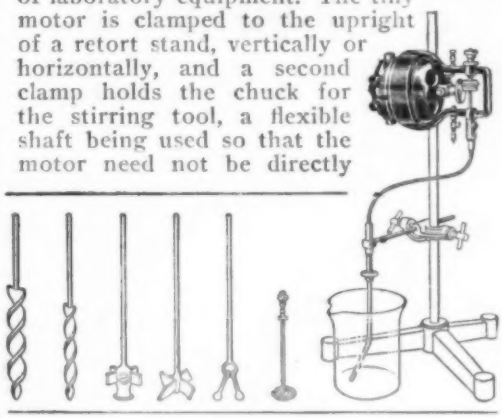
Some mechanics never acquire dexterity in the correct reading of a micrometer, or make frequent mistakes in com-

In the New Micrometer, the Numerals are Read Directly in the Windows of the Ferrule, without Figuring

putations. An eastern toolmaker now offers a direct-reading "mike," in which the numerals are observed through small windows in the ferrule, making line reading and subsequent figuring entirely unnecessary. The instrument is made with from 1 to 6-in. opening, reading to .001 or .0001 in., and is supplied with or without ratchet stop and locknut. It is also made with graduations conforming to the metric system.

STIR FLUIDS IN LABORATORY WITH ELECTRIC MOTOR

Electric power is now applied to the stirring of liquid chemicals, by a new unit of laboratory equipment. The tiny motor is clamped to the upright of a retort stand, vertically or horizontally, and a second clamp holds the chuck for the stirring tool, a flexible shaft being used so that the motor need not be directly



The Electrical Liquid-Stirring Unit Mounted on a Stand, and at the Left, Some of the Tools Used

over the work. By means of a friction disk and a thumbscrew, the speed may be varied from zero up to about 3,000 r.p.m. Two binding posts on the frame provide for connection with rotating terminals, for electrolytic work. A variety of stirring tools, suitable for different chemicals or purposes, may be used.

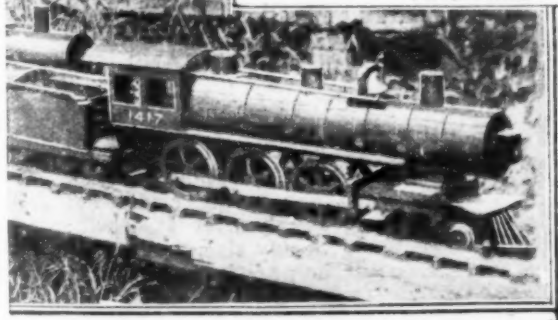
Preceded by a Full Band, an Extraordinary Funeral Procession Recently Moved through the Streets of Newark, New Jersey, Witnessed by Some 10,000 Persons. The Deceased Object of All This Attention Was a Canary Bird, the Pet of a Local Cobbler

Even Grown-Ups might Covet Such a Plaything as Two Complete Railway Systems, with 660 Feet of 4-Inch-Gauge Track, Eight 4½-Foot Locomotives, 26 Cars, and a 32-Wagon Circus. An Iowa Carpenter Spent Eight Years Making It for His Two Boys

Out of Over 300 Schoolboy Participants in a Denver Contest to "Do the Birds a Good Turn," These Four Won the Prizes Because the Rustic Bird Cottages They Built were Adjudged the Most Substantial and Practical

Eight Students in a Columbus, Ohio, School are Taking Group Instruction in Piano Playing with the Aid of Cardboard Charts Painted like Piano Keys. When They have Found All the Notes of a Piece, They Try a Real Piano

Free Outdoor Picture Shows, Free Music, and Ice-Cream Cones at Cost, are Delighting the School Children of Des Moines, Iowa. While the Films Are Mostly Educational, Some Comedy is Given for Relief. A Truck Carries the Entire Paraphernalia



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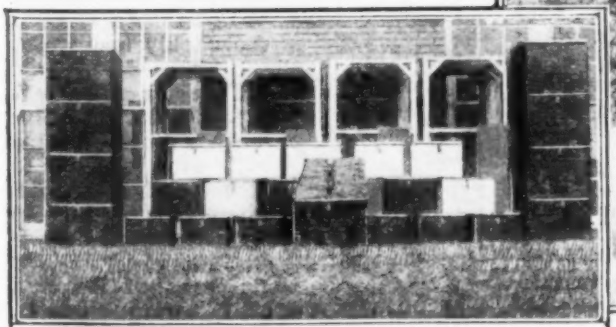
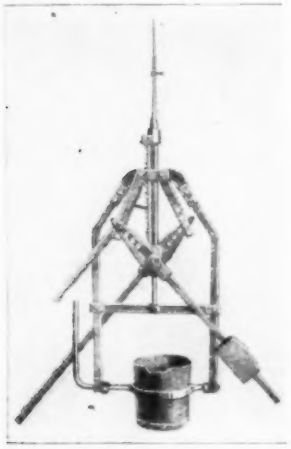
A One-Month Old Pony of 28 Pounds' Weight and 26 Inches' Height Is Pretty Small. But "Little Frisky," of Milwaukee, Scaled Only 17 Pounds When Just Born



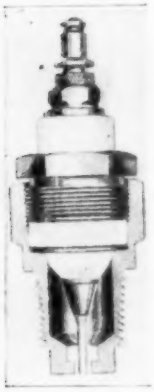
When Shelby County, Indiana, Recently Gained 33 Precincts, and So Needed More Voting Booths and Ballot Boxes, a High-School Manual-Training Class Undertook the Task, and the Boys' Work Saved the Taxpayers Considerable Money

CRUCIBLE-POURING DEVICE LIGHTENS FOUNDRY WORK

In foundries where a recently developed crucible-pouring device has been installed, it is found that one man can do almost as much as two by the old method of pouring. The machine is built to lift crucibles of various capacities and is suspended by a light crane. The same machine can be used for rolling over, lifting off, or shaking out, and for a variety of other purposes around the foundry.



COMBUSTION CHAMBER BLOWS CARBON FROM SPARK PLUG



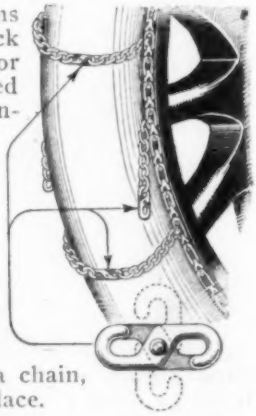
Two equal spark gaps and a tiny combustion chamber are the means employed in a new spark plug for keeping the points free from carbon. The spark jumps from the central point first to one and then to the other ground electrode, and what little soot is formed is blown out by the explosion in the chamber above. Massive stone insulation, not likely to crack, is another feature of the plug, which is declared to remain clean after thousands of miles of heavy use, assuring continued reliability of ignition and freedom from the usual ills.

TO ELECTRIFY RAILWAY LINES OF HOLLAND AND BELGIUM

Electrification of the 50 miles of railway connecting Amsterdam, The Hague, and Rotterdam, Holland, and the 63.6 miles of trackage between Brussels and Antwerp, Belgium, is about to be started. The Netherlands engineers, after studying American methods, have decided to adopt the multiple-unit train system, though some locomotives will be used. The Belgium project represents only the first stage of a complete system, which is to include the Luxemburg line and the lines radiating from Brussels. Passenger trains are to be run at 43 to 56, and freight trains at 25 to 28 miles an hour. It is computed that a 25-per-cent saving in coal will result.

TIRE-CHAIN COUPLING LINK REPAIRS AND TIGHTENS

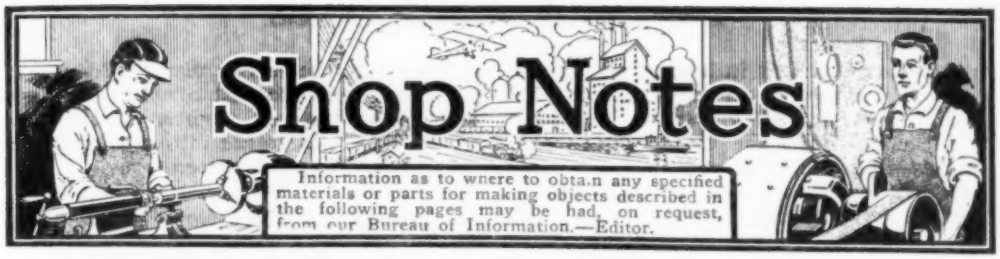
Broken tire chains are repaired, slack ones tightened, or two chains connected for towing in an instant, by applying a simple little coupling link just placed on the market. Two S-links with flat backs, reversed and riveted loosely together, constitute the invention. Hooked into the slack of a chain, it locks itself in place.



SAFETY GROUNDING CLAMPS PROTECT ELECTRICIANS

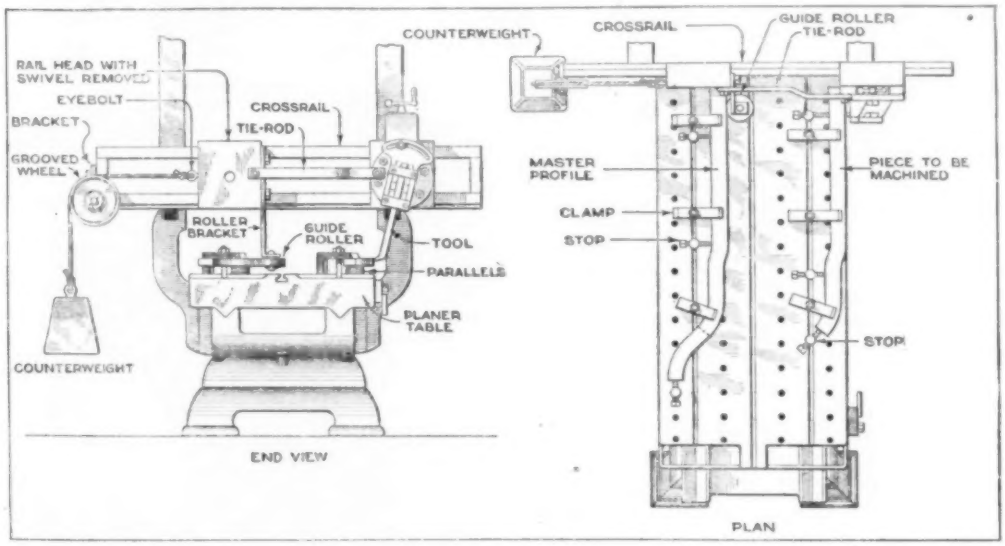
A new safety device for the man who works with high voltages has made its appearance in the form of a grounding clamp. The spring clamp fits snugly over feed wire of any size, and makes a positive electrical contact. The tool is provided with a detachable handle that is thoroughly insulated.

¶The bacchanal's dream of a pipe line inexhaustibly flowing with wine is about to be materialized in Spain, where it is planned to lay 63 miles of drawn-steel pipe, from the vineyards of Requena and Utiel to Valencia, to expedite the shipment of 26,000,000 gal. of wine a year. This remarkable system is expected greatly to reduce shipping expense.



Machining Profiles on the Planer

The method described in this article was used by a large machine shop to profile work on the planer. The feed screws were removed from the crossrail of a two-headed planer, and a bracket, carrying a grooved wheel, was screwed to one end of the crossrail. Opposite the grooved wheel, on the near head, a hole was drilled and tapped, and an eyebolt inserted to take a steel cable, which ran over the grooved wheel as shown in the drawing. To the same head was fastened the bracket, which extended down to the planer table, and which carried the guide roller. A tie-rod of suitable length was then used to connect the two heads, and the planer was ready for placing the work. A master plate of the desired profile was clamped down to the table, as shown, being held against stop pins to prevent lateral movement under the pressure of the guide roller; the roller was brought up to the master, and a heavy counterweight was fastened to the steel cable to keep the roller and master in contact. The work was clamped down under the other head, which carried the tools.—G. A. Volz, Monroe, Mich.



By Removing the Feed Screws from the Crossrail of a Planer, Fastening the Heads Together with a Tie Bar, and Counterweighting the Heads, a Profile was Successfully Reproduced, the Pieces being Machined Accurately, and in Quick Time

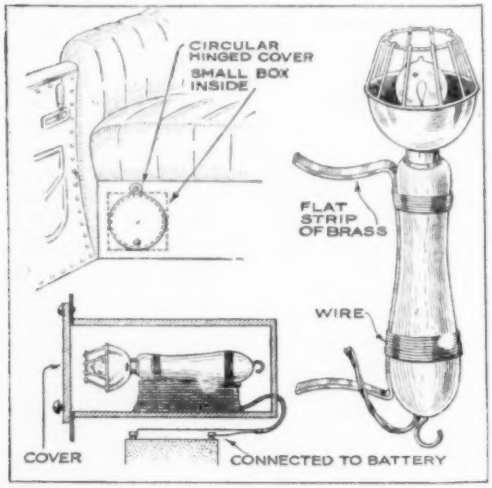
Undercutting Mica Commutator Strips

One of the common jobs of the electrical repair shop is cutting down mica insulation between commutator bars on motors and generators. The metal wears down faster than the mica, and the latter is left projecting, which causes sparking and burning of the bars. When the commutator is trued and resurfaced, it is customary to undercut the mica. In all but the smaller machines, this operation is best accomplished by supporting the armature between the centers of a lathe and using the crossfeed to run a sharp-pointed tool, held in the slide rest, along the strips of mica insulation. The armature must be set in the lathe in such a manner that the strips of insulation will be perfectly parallel with the line followed by the cutting tool. A good method of doing this, where the bars are not exactly parallel with the shaft, is to support the armature shaft at

the commutator end in a steady rest, instead of carrying it on the center in the usual way. The steady rest can be set to hold the job with the commutator bars in precisely the correct position, at a considerable saving in time and trouble.—Howard Greene, Broadway, N. Y.

Trouble Lamp Always Kept Handy

While trouble lamps on automobiles are practically indispensable where tire



An Arrangement Which Makes the Trouble Lamp Easy of Access, and Which Keeps Lamp and Cord in Good Order

or engine trouble is met with at night, the length of cord required is somewhat bothersome, usually becoming entangled with everything in the tool box. A small box, large enough to contain lamp and cord, is built at one end of the tool compartment. A flat strip of brass is bent, as shown in the drawing, and securely wired to the lamp; this serves as a cleat to wind the cord around. A hinged cover, closing by its own weight, is provided, and the connection to the battery is taken out through the rear end of the box. This makes a very neat arrangement, finding and using the lamp being the work of but a moment.—G. A. Luers, Washington, D. C.

Wire-Fence Frame for Snow Houses

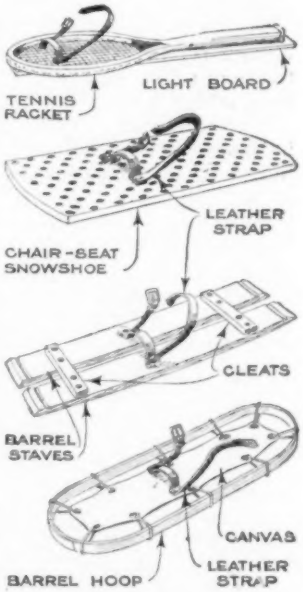
Boys have a lot of fun building snow forts and houses, but generally the result is more or less unsatisfactory. However, by forming wire fencing into the shape of an Eskimo igloo and covering it with tightly packed snow, a first-class and lasting snow house is the result. After the snow has been packed around the wire form, it is watered slightly so that the whole mass will freeze into a solid piece. —Wm. E. King, Monessen, Pa.

Preventing Bolts from Turning

When placed in wood, the square shank of a carriage bolt seldom prevents the bolt from turning when a rusted nut is to be removed. This movement of the bolt can be prevented by drilling a small hole through the head of the bolt and driving a nail through it into the wood, parallel with the bolt. If the bolt head is not accessible, the same plan can sometimes be followed by drilling through the wood and the bolt at right angles, and inserting the nail as described.

Homemade Snowshoes

A serviceable set of snowshoes can be made from almost anything broad and light enough to be worn comfortably. Thus, two chair seats, trimmed off to the desired form, may have thongs attached to them for fastening to the feet, as indicated in the drawing. Another idea is to join two barrel staves together at the ends with cleats, to make the individual shoe, thongs being provided for attaching to the feet. Barrel hoops can also be used, by stretching a piece of stout canvas across the hoops so tightly that the latter are bent to an oval shape. Also, as might be expected, tennis rackets that have seen better days may be utilized for the same purpose. The operation is simple and consists merely of attaching cleats to the underside of the racket, for the fastening of thongs, and a light board, 4 or 5 in. wide, under the handle, as shown.

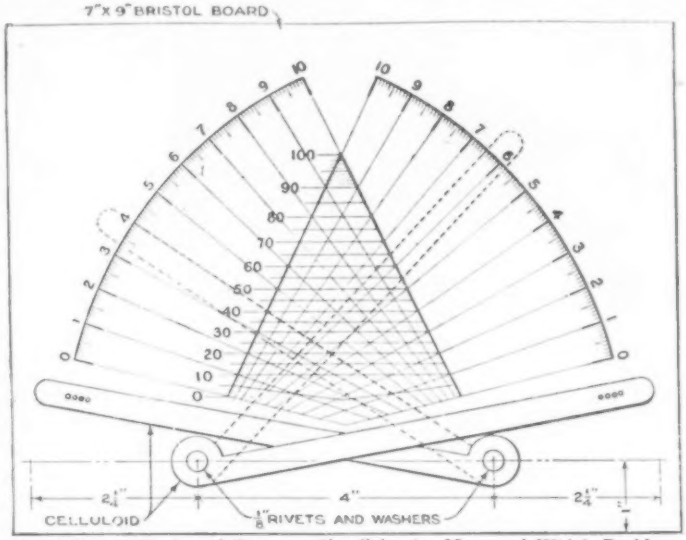


A Device for Rapid Multiplication and Division

BY H. HERTZBERG

AN easily made device for the rapid division or multiplication of whole or decimal numbers can be made from a piece of stiff Bristol board and two strips of transparent celluloid. A heavy piece of Bristol board, 7 by 9 in., is selected, and two centers are made 1 in. from the lower edge of the card and about 4 in. apart. From these points the entire chart is drawn and plotted as shown.

Two arms of transparent celluloid, about 1/16 in. thick, are made to the shape and dimensions shown, with a hole at the large end for riveting. The opposite end of each arm is drilled with four small holes for the insertion of a pencil point when drawing the scales; these arms are riveted to the card with round-head copper rivets and washers, to permit free movement without lost motion, which would cause a loss of accuracy.



A Cardboard Device of Extreme Simplicity by Means of Which Problems of Multiplication and Division are Worked Out with Speed and Accuracy

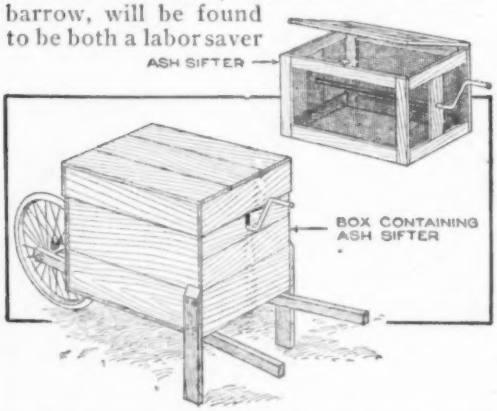
The two curved scales are first drawn by inserting the point of a pencil into the holes of the celluloid arms and these curved lines are divided into scales of 10 cardinal points to read from 0 to 10, as shown, and each cardinal division is subdivided into 10 equal parts. All radial lines of the scales are drawn with the upper edge of the celluloid arms, which must be perfectly straight and radiating from the center.

The two curved scales are used for multiplying and the product scale is plotted in the following manner: Draw straight radial lines from each cardinal point to the pivot centers as shown, using the arms as rulers. The triangle and horizontal lines are next drawn from the intersecting points; these points are the cardinal points of the product scale and should be drawn and inked heavily. The spaces between these cardinal points are subdivided into 10 equal parts and light subdivision lines are drawn and inked in parallel to the cardinal lines from 10 to 100; from 0 to 10 the lines forming the subdivisions are not parallel to the division lines, but must be located by performing two multiplications for each division, joining the intersections and continuing the lines to the center and sides of the triangle; for example, to locate subdivision 4, multiply 2 by 2, mark the point of intersection, multiply 4 by 1, mark this point also, and join the points, continuing the line until it meets the center and sides as described. To avoid confusion, only one division is shown subdivided. The cardinal lines are numbered in the scale at the left of the triangle in multiples of 10, as shown, in order to make the device applicable to the decimal system, so that any whole or decimal number may be multiplied or divided by simply inserting the decimal point in the proper place or by adding the proper number of ciphers in multiplying large numbers.

In operation, for example, it is desired to multiply 400 by 650; place one arm on 4 and the other on 6.5 when the intersection will be at 26 on the center scale and as there are six numerals in the multiplier and multiplicand there will be four ciphers to add, making 260,000 the product. To divide the number 260,000 by 400, place the arm on 4 of the left-hand scale, and then bring up the other arm until the intersection is on 26 when the quotient will be 6.5 on the scale at the right, and by removing the decimal point two places to the right the answer will be 650. A little practice with this device will make it possible to formulate rules for placing the decimal point and to obtain results as quickly and accurately as with a slide rule, although its cost is but a fraction of the price of that instrument.

A Wheelbarrow Ash Sifter

A revolving ash sifter inclosed in a wheeled container, similar to a wheelbarrow, will be found to be both a labor saver



An Ash Sifter in a Dust-Tight Container is Mounted on a Homemade Wheelbarrow, and can be Moved In and Out of a Basement without Trouble

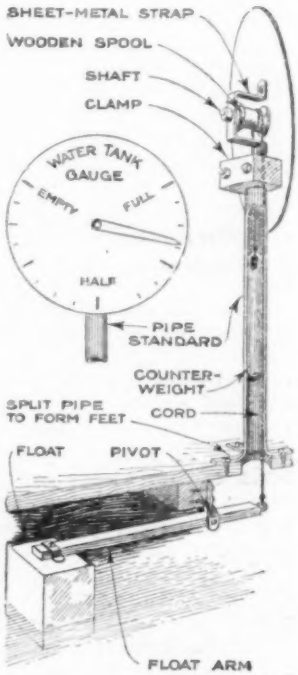
and an aid to domestic cleanliness, all that is necessary being a revolving sieve pivoted on a wheelbarrow. To make the sieve, cover a wooden frame with 3/8-in. mesh wire screen, and fit it with a hinged cover and an iron rod, or shaft, with a crank at one end. The wheelbarrow is simply a wooden box with slots at both ends to form bearings for the shaft, and provided with wooden legs, handles, a wheel taken from an old bicycle, and a close-fitting cover which practically makes it dust-tight. With this arrangement it is possible to sift the ashes at the furnace, causing no more dust than is occasioned by the usual transfer to an ash can. A few turns of the crank completely separate the fine material, and the sifter may then be wheeled away to any convenient place and left covered. The next time it is used, the cinders may be removed without causing any dust, and when sufficient fine ash has accumulated in the box, the wheel makes it easy to dispose of it. There is no difficulty in getting the barrow out of the basement, as the diameter of the bicycle wheel makes it a simple matter to push the whole outfit up a flight of stairs.—R. L. Wales, Kingston, R. I.

Air Chamber Prevents Tank from Bursting

Cracking, and possible ruin of concrete watering trough by freezing, was prevented on a ranch by the simple dodge of anchoring an empty 5-gal. can to the bottom of the tank. The can, which was square, was made air-tight by screwing the cap down tightly against a rubber gasket, and was then anchored to the bottom by a rock. As the can was kept well below the surface of the water, the pressure of the freezing water against the sides of the tank was in a large measure prevented by the collapse of the sides of the can.—Dale R. Van Horn, Lincoln, Nebraska.

A Water-Level Indicator for a Concealed Tank

A practical and trouble-proof gauge for indicating the water level of a concealed tank can be fitted to almost any tank, as shown in the drawing. The float, in this instance a tightly stoppered varnish can, is attached to one end of a hinged wooden arm, as indicated. The opposite end of the arm is provided with a screw-eye, to which one end of a stout cord, or flexible wire, is attached. The indicator dial is made of wood or sheet metal and is supported on a pipe standard as shown, the lower end of the pipe being split and spread at right angles to form feet, which are bolted to the top of the tank. The pointer, or indicator, is made of polished tin or brass, and is attached to one end of a light shaft, to which a wooden spool or drum is secured, behind the dial, a sheet-metal strap supporting the rear end of the shaft, as shown. The cord or wire from the float arm is brought up through the pipe and is given two turns around the spool. The free end of the cord has a suitable counterweight attached to it which is concealed inside the pipe standard.

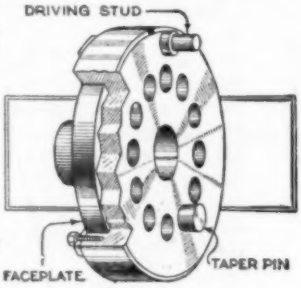


Imitating White Tiling

A good way for anyone inexperienced in making imitation tiling in the soft plaster of a kitchen or bathroom, is to allow the plaster to dry hard and then apply a chair mold, or rail, 4 ft. from the floor. The plaster between the baseboard and chair rail is given a coat of white paint and after this has thoroughly dried, the tiles are marked out, 3 by 6 in. for the kitchen, and 2 by 8 in. for the bathroom, with a carpenter's pencil. Avoid the use of indelible pencils. Then apply a coat of clear varnish, and after this has dried, a second or even a third coat. Such a surface can be kept clean by washing with soap and water.—Matthew Hyndman, North Bend, B. C.

Faceplate for Multiple-Thread Cutting

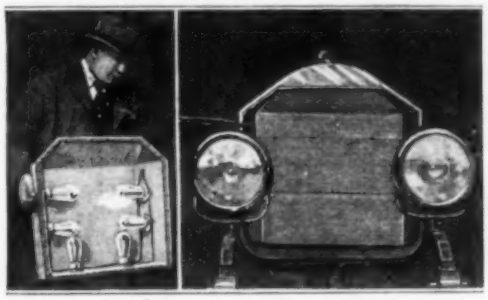
When cutting a thread, or worm, having more than one lead, the device shown in the drawing will be found very useful. A small faceplate is mounted on the lathe, and a cut is taken across the face and around the circumference, to insure its running truly. A plate, of machine steel or cast iron, is then counterbored to revolve easily on the faceplate, as shown; this plate carries the driving stud, and is bored with 12 equidistant holes, which must be accurately laid out and bored. A hole is drilled in the faceplate to correspond with these 12 holes, and a taper pin is fitted, as shown. The outer plate is held to the faceplate by three pieces of machine steel screwed to the counterbored edge.



The operation of the device is simplicity itself; if, for instance, a triple-threaded screw is to be cut, the first lead is made in the usual manner. Then, without moving the tool or carriage, remove the taper pin from the device, turn the outer plate through one-third of a revolution, that is, four holes, insert the pin again, and proceed to cut the second lead; the operation is repeated for the third lead. Twelve holes are used, as this will enable the operator to cut two, three, four, or six threads in much less than the usual time.

Electric-Lamp Radiator Heater

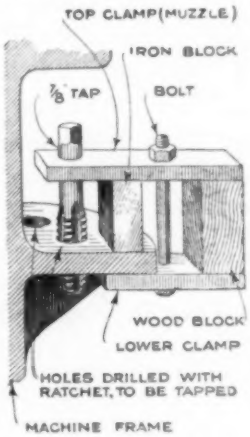
The photograph shows an electric-lamp automobile heater that keeps the engine sufficiently warm so that there is little or no difficulty in starting and no danger of freezing. The heater is made of wood and lined with asbestos paper. Six 20-watt tungsten lamps are wired on three sides of the heater; by using carbon-filament lamps only three will be needed, but it is better to have six lamps, any number of which can be burned according to the temperature. The box fits snugly behind the headlights, which hold it against the radiator. Thick felt strips are tacked to the edge of the box to exclude cold air.



An Electric Radiator Heater That Makes Starting Easy and Eliminates the Possibility af Freezing: The Heater is Made of Wood and Lined with Asbestos Paper

Clamp Aids in Tapping Drilled Holes

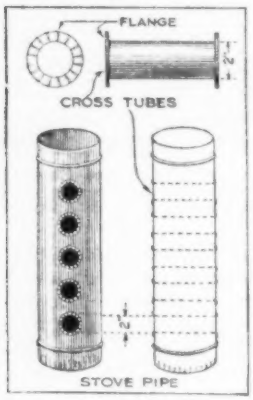
While erecting some heavy machinery, I encountered some few holes which had not been tapped by the builders of the machine. These holes were in a flange, which ran around part of the body beneath an overhanging portion, so that a tap wrench could not be used. To turn in a ⅞-in. tap with a monkey wrench and make the tap run straight was more than the builders had cared to do. The way I turned the trick was to bolt a muzzle clamp on the shank of the tap, as shown in the drawing, which served as a guide. The hole in the muzzle was drilled a few thousandths of an inch larger than



the diameter of the tap shank, and oil was used liberally on both the shank and the threaded part.—J. V. Romig, Allentown, Pa.

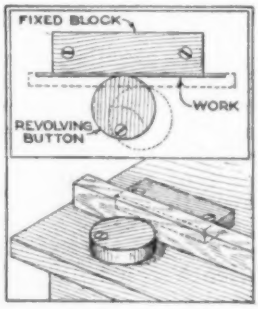
Stovepipe Radiator Saves Coal

A room in which there is a long stovepipe can be warmed more economically, and more evenly, if the stovepipe is made into a radiator, as indicated in the drawing. Holes, about 2 in. in diameter, are made in opposite sides of the pipe, short lengths of 2-in. pipe are inserted, and the ends flanged. The additional radiation area provided by the cross tubes makes it possible to effect a considerable fuel economy.—Neil D. Cameron, Athelstan, Que.



A Simple and Effective Bench Dog

A bench dog that provides a firm grip on work of different thicknesses, from an inch to the thickness of a shingle, is made as shown in the drawing. A hardwood block is fixed to the bench and a circular button is mounted eccentrically with a single screw, as shown, so that when the wide part of the button is turned toward the block the two parts will almost touch. Both parts are slightly beveled under so that they may grip the work more tightly at their upper edges and prevent it from rising.—H. F. Grinstead, Columbia, Mo.

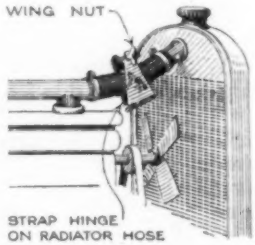


Removing Yellow Stain from Rubber

It is well known that the exposed surfaces of fountain pens, and other articles of hard rubber, frequently change from a glossy black to a dirty yellowish-brown color. This unsightly color may be removed and the rubber restored to its pristine blackness by soaking it for several hours in a warm solution of lye which dissolves the yellow coating. Rub this off with a rag, smear the surface with oil, and after wiping it off, polish the rubber with chamois skin. Care should be taken not to use the solution too warm, as hard rubber softens under the action of heat, and the article may be rendered useless or lose its shape.—Thos. R. Baker, Winter Park, Fla.

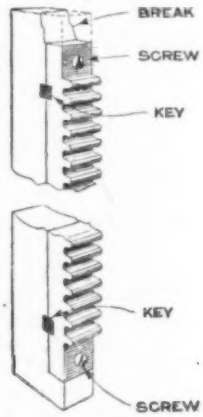
Hose Clamp Limits Engine Cooling

In cold weather it is necessary to reduce the effect of the cooling system, if the best operating conditions are to be obtained. The drawing shows how too rapid cooling of the engine can be prevented. An ordinary strap hinge is fastened to the radiator hose with wire; a bolt and thumbscrew in the end screw holes providing an easy means of controlling the circulation. In very cold weather the hose may be almost closed, thus cutting off most of the circulation and allowing the engine to run hotter, although the radiator will be cooler. As the weather moderates, the clamp is released, permitting better circulation.



Repairing Drill-Press Feed Rack

While using a high-power radial drill press the heavy downward pressure was so great that the shoulder on the rack was broken, as indicated in the drawing, and the screws sheared off. Obviously, it was impractical to make a repair that would throw the entire strain on the feed-rack screws. After the sheared off screws had been drilled out and the holes tapped, keyways were cut in both rack and sleeve and the rack fastened with new screws, while keys, made from 5/8-in. key steel, were driven into the keyways, as shown in the drawing, to take the end pressure.—A. A. Stafford, San Francisco, Calif.

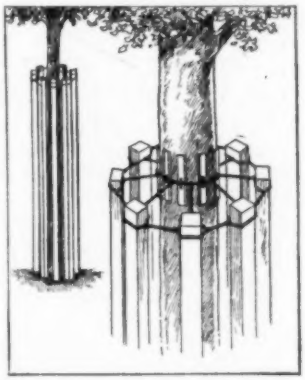


Reading Decimal-Equivalent Tables

Most decimal-equivalent tables are difficult, or at least confusing to read, on account of the close spacing of their large number of figures. A convenient little device that brings the equivalent sought to light without possibility of confusing it with some other, may be easily made. The eighths, sixteenths, thirty-seconds, and sixty-fourths are written in separate columns on a piece of heavy drawing paper, or thin, stiff cardboard. An envelope is made to hold the card, with small slots at the top through which the decimal sought is shown separated from the others as the card is pulled out of, or pushed into the envelope.

A Neat and Strong Tree Support

The tree support shown in the illustration will be of interest to those who have difficulty in inducing young trees to grow straight and in guarding them from knocks.

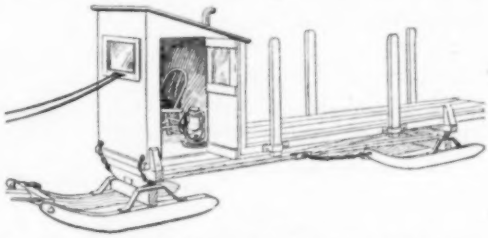


Eight 1 by 1-in. sticks, about 4 ft. long, are driven into the ground to form a circle around the tree at a distance of about 9 in. The tops of these sticks should all be at the same height, and be wired together as shown in the drawing. Eight small sticks, about ½ by ½ by 2 in., are provided, and these are wired around the trunk of the tree in the manner shown. A small staple driven into each stick, over the wire, holds them in place. Attach short wires from the wire encircling the tree to the outer wire, taking care that the tree is in the center of the ring formed by the sticks. The sticks about the tree trunk should not be drawn up so tightly as to constrict the growth of the tree, but sufficient space should be allowed for its free growth, and as soon as this space has been occupied, the inner ring should be loosened.—Frank L. Matter, Portland, Ore.

¶Headlight lenses can be frosted by applying a saturated solution of Epsom salts to the back.

Shelter Built on Lumber Sled

Men who haul lumber or freight often suffer from the biting cold of winter

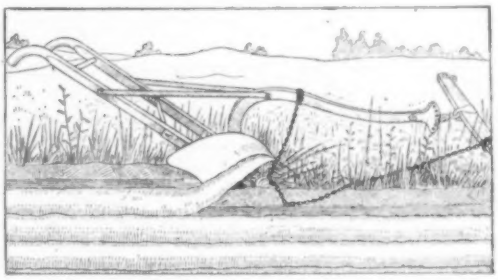


For Preventing Chilblains and Frostbites a Teamster has Attached the Cozy Cab Shown in the Drawing to a Bobsled Used for Hauling Lumber and Freight

mornings, but the man who uses the arrangement shown in the drawing does not. A small cab, 5 ft. high and 4 ft. square, was built on the sled, as indicated. A door was located at one side, and a window was provided in each side, so that the driver can see in all directions. The roof is covered with roofing paper, and a section of stovepipe acts as a ventilator. The whole arrangement is so light that it can be removed and set aside when the sled is being loaded; it is then set back on top of the load. If there is any danger of its falling off, the driver simply throws a chain down from the eyes at each of the bottom corners and anchors it to the sled. A chair, and a lantern to keep the temperature comfortable, complete the equipment.

Chain Attachment Helps in Plowing

By attaching a length of moderately heavy chain to the turning plow, in the manner shown in the drawing, the work of turning under weeds and trash is not only facilitated, but a much neater and more satisfactory job is obtained. Enough slack is allowed in the chain so that it will drag lightly on the earth in the bottom of the previously plowed furrow,

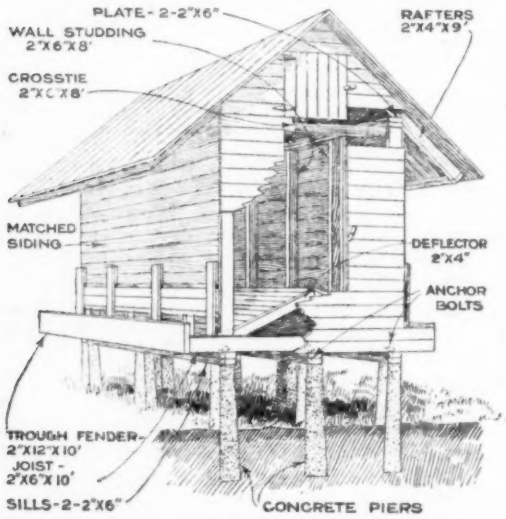


A Length of Chain Attached as Shown, Aids in Plowing Under Undesirable Vegetation

which it will do automatically. This is almost indispensable when turning over land for sowing hay and forage crops, where undesirable vegetation has reached such a height that the bare plow will not completely cover it.

A Feeder for Cattle

In some parts of the country, the easily constructed cattle feeder shown in the



A Cattle Feeder That Is Particularly Useful for Feeding Cattle during the Winter, on Chopped Forage, or Grains: It Holds Approximately 500 Bushels of Feed

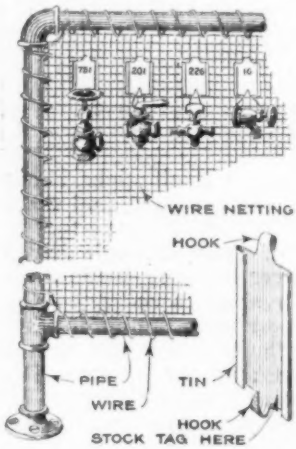
drawing has been found to be a worthwhile addition to the stock raiser's equipment. In those localities where cattle are fed throughout the winter on chopped ear corn, ground corn, cob and cottonseed meal, this type of feeder is generally used. A common size is about 8 by 10 ft., with a capacity of approximately 500 bu. of feed. The feeder is best built 2 ft. above the ground, and, if a permanent location can be had, the foundation should be of concrete. A movable feeder, similar to the permanent one shown, can be made by mounting the structure on heavy timber skids, so that a team can haul it to any part of the feed lot.

If concrete piers are to be used, anchor bolts should be imbedded in the tops so that the double sills can be bolted securely to the foundation piers. The floor joists should extend 1 ft. beyond each side of the building, to form feeding troughs, as indicated; the joists are spaced 2 ft. apart and spiked to the wall studs. This makes a solid job and prevents spreading. A double plate is spiked to the tops of the studs, to provide a base for the rafters, but before the roof is built, the studs on opposite sides are joined together with crossties.

When the structure is filled with feed there is considerable horizontal pressure against the walls, and consequently they should be well braced to prevent spreading and bulging. The triangular deflector, which takes the place of a floor, distributes the stored feed equally to the troughs. Adjustable slides may be arranged on the sides to control the amount of feed running into the troughs. The roof is built with wide eaves and covered with roofing paper, and the walls are covered with matched siding nailed to the studs. Doors are provided at one or both ends of the feeder for convenience in filling. All parts should be built with an eye to strength, as fat steers will speedily smash up a flimsy building around the feed lot. An approximate bill of material for such a feeder will consist of 2 bbl. cement, 6 sills, 11 joists, 22 studs, 4 wall plates, 6 crossties, 10 pieces for grain deflector, 12 rafters, 2 feed-trough fenders, and 700 ft. of matched siding.—W. E. Frudden, Charles City, Ia.

A Novel Stockroom Display Rack

Making up stockroom display racks and arranging samples thereon, properly tagged and numbered, is in most factories a laborious and time-consuming task. A clerk in one establishment has improved on the usual practice by making a gas-pipe frame of the proper size and covering it with wire netting. This arrangement can be made to stand on the floor by providing it with suitable legs and floor flanges, or it can be suspended from hooks on the wall.



Combination hooks and tag holders, similar to those shown in the drawing, were made from sheet metal, and the edges were turned over to make grooves for the insertion of the stockroom tag. The parts are suspended from the hook at the bottom of the tag holder by wire

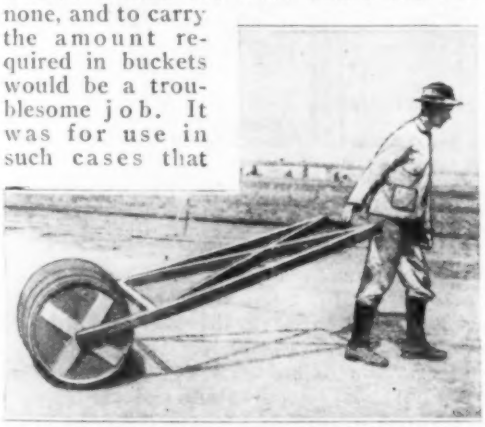
loops. In this manner the samples can be easily arranged, and any change in style or model merely requires a change of tags in the holder, while the discontinuance or addition of samples may be taken care of without difficulty at a moment's notice.

Kerosene as an Antifreeze Solution

The use of kerosene in automobile cooling systems to prevent freezing, while effective, is open to numerous objections. The oil vaporizes at a lower temperature than water; consequently, if the temperature r ses, the cooling effect is reduced and overheating of the engine follows. Another objection to the use of kerosene for this purpose is the danger of fire from the inflammable gas that is generated when the oil becomes heated. Besides, kerosene gives off a disagreeable odor when heated, and rapidly decomposes the rubber radiator connections. But if one is willing to waive the objections enumerated he can depend upon kerosene not to freeze.

Device for Rolling a Barrel

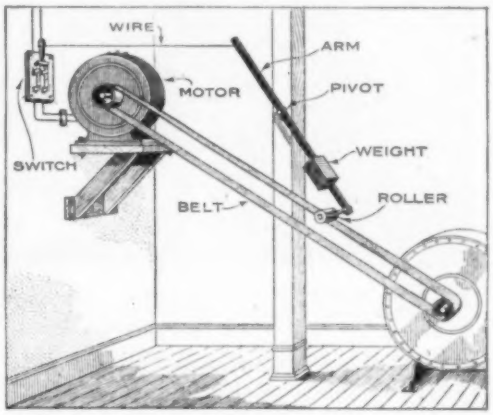
Quantities of water are sometimes needed around the farm where there is none, and to carry the amount required in buckets would be a troublesome job. It was for use in such cases that the device shown herewith was made. As will be readily seen, the construction is very simple; a cross is nailed to each end of the barrel, in the center of which are fastened a pipe flange and a short length of pipe which fits into a hole in the rear end of the shafts. Besides serving its original purpose as a water carrier, it also makes an excellent roller when filled with water.



An Empty Barrel Arranged to Transport Water to Distant Points on the Farm, Where Water is Needed, Instead of Carrying It in Buckets

Circuit Breaker Stops Motor When Belt Breaks

A simple arrangement for stopping an electric motor, in the absence of a circuit breaker, when the belt breaks or slips off the pulley, is shown in the drawing. A pivoted arm, having a roller and weight at its lower end, is connected to the switch, as shown, by a wire. Normally, the roller rides on the surface of the belt, but, should the belt break or slip off, the weighted end of the arm will drop to a vertical position and open the circuit.—Roy H. Poston, St. Francois, Mo.

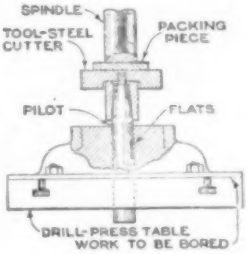


As Soon as the Belt Breaks or Slips from the Pulley the Weighted Arm Drops to a Vertical Position, Opening the Circuit and Stopping the Motor

Boring in the Drill Press

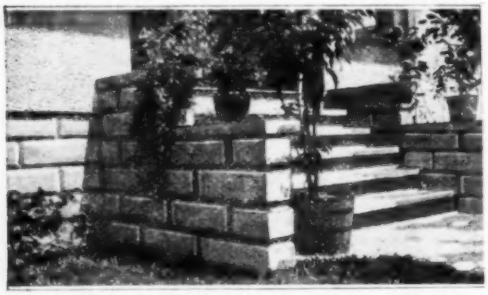
When boring holes of large diameter with a boring bar in the drill press, greater rigidity may be secured by using the spindle itself as the boring bar.

The cutter is inserted in the spindle slot as shown, and a pilot, having a threaded end, and tapered to fit the spindle socket, is used to draw the cutter firmly to its seat, the pilot being provided with flats upon which a wrench may be used. The pilot may be as long as desired, of a diameter suited to the work in hand, of the diameter of the center hole, or a bushing in the drill-press platen. By this method the boring bar is made just as strong and rigid as the machine itself.



Imitating Cement Blocks in Form Work

Being unable to obtain the concrete blocks with which to build the exposed

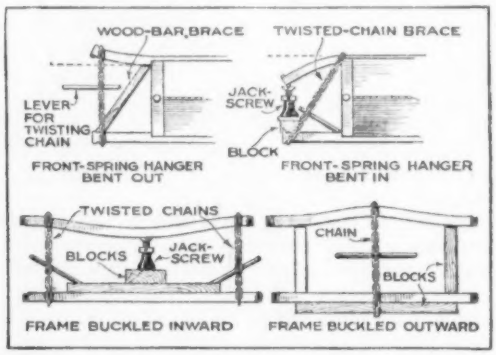


Confronted with a Shortage of Cement Blocks, the Builder Nailed V-Shaped Wooden Strips to the Forms with the Pleasing Result Shown Here

portion of a foundation, the builder overcame the difficulty by nailing V-shaped wooden strips to the inside of the outer form. These strips were nailed horizontally, 8 in. apart from center to center. The vertical strips were cut in a miter box so as to obtain a perfect joint. This was a simple matter, as after once obtaining the proper angle it was unnecessary to change the adjustment of the miter box. The forms were then put into position with proper regard to the location of the joints, and the result is shown in the photograph.

Straightening Bent Chassis Frames

A 10-ft. length of chain, a screw jack, and several wooden blocks of various lengths, constitute a simple and inexpensive equipment, that is available to all motor-repair shops, for straightening chassis frames. Cold bending is desirable except in the case of sharp bends, when the

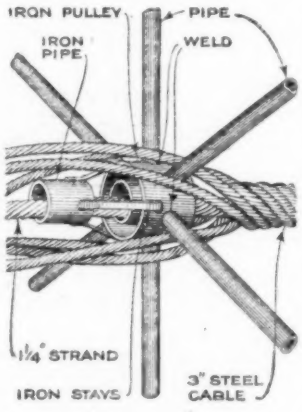


A Length of Chain, a Jackscrew, and Some Wooden Blocks Compose the Simple Equipment Needed for Taking Kinks Out of Chassis Side Rails

frame is heated locally with a blowtorch to prevent cracking. The main feature to be remembered, when straightening side-rails, is to provide longitudinal support for the side that is not bent, and to distribute the pressure over a large area. The chain and lever are used for exerting pressure inward, while the screw jack exerts an outward pressure, as indicated in the drawing.

Unwinding the Outer Strands of a Steel Hawser

Unraveling a mile and a quarter of 3-in. steel cable, to remove the six worn outer strands and save the undamaged 1¼-in. middle strand, was accomplished successfully by the tool shown in the drawing. Suitable lengths of iron pipe of a size to afford a good handhold and leverage were welded, with an oxyacetylene flame, to the rim of a small iron pulley in such a manner as to resemble the spokes of a wheel with tire and felloes missing. A short section of iron pipe, slightly smaller in diameter than the pulley, but larger than the shaft bore, was then connected to the pulley, on a line with the bore, by welding four strips of flat iron to both, as indicated.



The strands of the cable were then pried apart for a few feet, the inner strand was passed through the hub and its pipe extension, and the outer strands through the six spaces between the spokes. With the strands so adjusted, the device was revolved against the winding of the cable and advanced as the strands unwound, the inner strand being allowed to lie in a continuous length along the course of the work. The worn strands were cut into convenient lengths with the oxyacetylene flame as the unwinding progressed, and were disposed of as junk, the central strand being coiled and the scrap collected on the completion of the job.

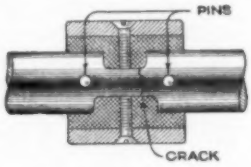
¶A small amount of powdered chalk added to glue makes it stronger and more durable.

Safety Setscrew Used as Socket Wrench

A safety setscrew, one of the type tightened by a hexagonal key, was drilled for a tight fit on a piece of drill rod. The rod was drilled at its outer end and a smaller rod was inserted at right angles for a handle, producing an excellent socket wrench for small nuts.—R. H. Kasper, Philadelphia, Pa.

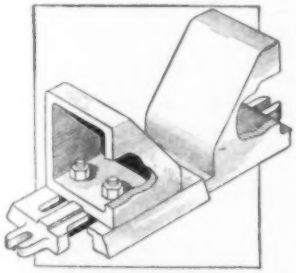
A Temporary Shaft Repair

Shafts will break down at inopportune times when the possibility of a permanent repair is out of the question, and at one such occurrence, the difficulty was overcome in this manner: The shaft gave way at the point indicated. The first thing done was to cut two flats on opposite sides of the shaft. A piece of cast-iron pipe was placed over the shaft, holes were drilled through both pipe and shaft, and pins inserted to hold the ends of the latter together. Afterward two other holes were drilled and tapped and provided with setscrews, and the space between the pipe and shaft was filled with melted babbitt, making an excellent temporary repair.



An Adjustable V-Block

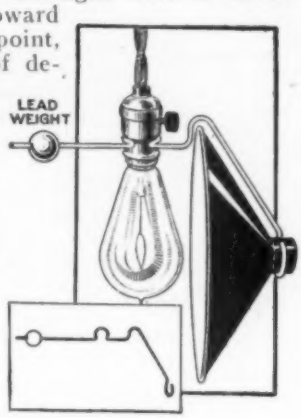
The V-block shown in the accompanying drawing has been found to be a very convenient accessory when cylindrical work is set up on metal-working machines, as it is easily adjusted to accommodate work of different diameters.



This block consists of a base which is bolted to the machine table by means of the end lugs, and an adjustable jaw which is kept in alinement by the tongue-and-groove arrangement shown. When it is desired to open or close the block, the two bolts that clamp the adjustable jaw to the base are loosened, the adjustment made, and the bolts tightened; these bolts should be made with square heads to fit the slot in the base, to prevent turning.

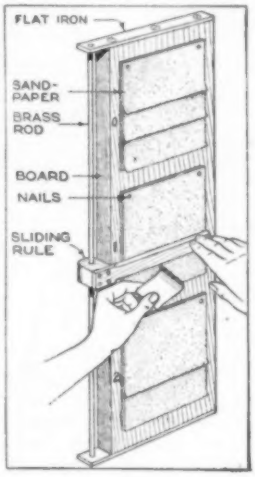
An Adjustable Electric-Lamp Shade

It is often desirable, in the shop or office, to direct the light from a shaded drop lamp toward some certain point, and all sorts of devices are resorted to in order to obtain the proper adjustment. By using the device shown in the drawing, the shade is made instantly adjustable. A piece of stiff steel wire is bent as shown, to fit over the lamp receptacle and shade, and a weight is provided on the outer end of the wire to counterbalance the shade.



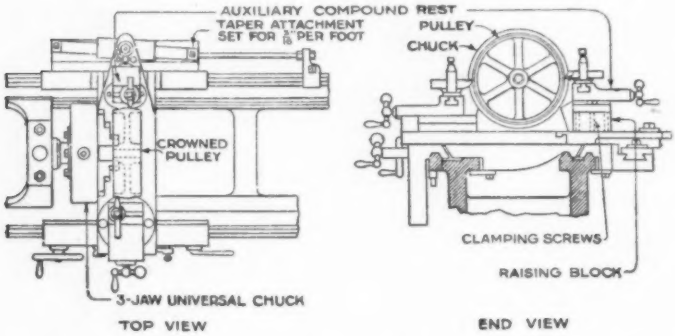
Holder Economizes Use of Sandpaper

Appreciable economy in the use of sandpaper, in patternmaking shops and other places where considerable quantities of this form of abrasive are used, can be effected by the sandpaper holder shown in the drawing. A board, long and wide enough to hold the different grades of sandpaper, from No. 00 to No. 2, is the principal part of the holder. A bundle of each grade is fastened to the board with nails at the upper corners of the bundle. A brass rod is fastened at the top and bottom of the board, and a ruler or paper cutter, having a hole in its end through which the rod passes, is free to work up and down whenever a piece of sandpaper is to be torn off. Using this arrangement, the workman can tear off just the amount of sandpaper he wants, without destroying or wasting a whole sheet when but a small strip is wanted.—M. E. Duggan, Kenosha, Wis.



Turning Two Tapers at One Setting

Having a large number of crown pulleys to make, one mechanic cut the time of doing the job practically in two by using two tools at one time. A small compound slide rest was taken from another lathe, and set on the back of the cross slide, upon an iron block to raise it to the proper height, slide rest and block being fastened to the cross slide by long cap screws.

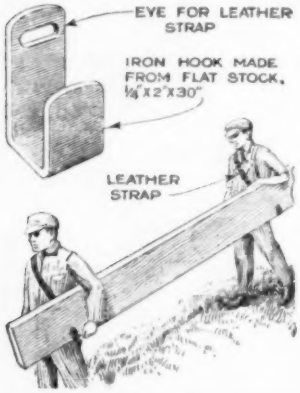


By Using Two Tools in Connection with the Taper Attachment, the Time Required for Turning Pulleys was Cut in Half

The cross-slide nut was disengaged and the taper attachment set over the required amount; then the front tool was sunk into the center of the pulley to the proper depth, the rear tool was adjusted to take a corresponding cut on the edge of the pulley, and the cut started. Both angular faces are by this means finished at one pass.

Hooks Aid Lumber Handlers

A lumber handler observed that sore backs and shoulders caused by carrying lumber was a common complaint. He induced the yard blacksmith to make several hooks, such as the one shown in the drawing, from flat stock, ¼ by 2 by 30 in. An eye was cut into the upper end to accommodate a leather strap. In use, these hooks are worn over the shoulder of the workman, as indicated. Since they have been in use, the men have been able to carry heavier loads, walk faster, maintain better balance, all with greater convenience and less fatigue than formerly.

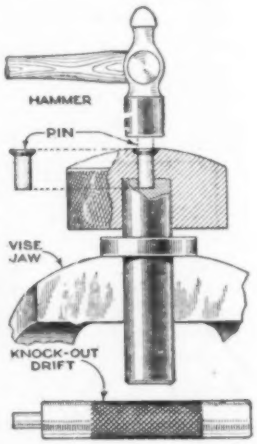


Snow Track for Hauling Ice

To make it possible to haul ice from the river where it was harvested to a place of storage on shore after the snow had melted, it was necessary to build and maintain a snow track. Bobsleds were, of course, the only thing on the ice, but no team could pull a loaded sled over the bare pavement. The track was formed by spreading the snow scraped from the ice harvest and scraps of ice over the route to the ice house.—C. L. Meller, Fargo, N. D.

A Fixture for Swaging Rawhide Pins

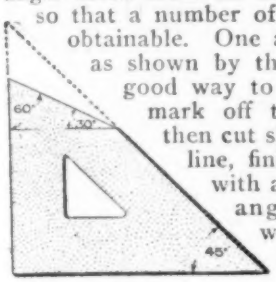
In manufacturing some special machines, rawhide pins with flat heads were needed, and as these were not a commercial product, we were forced to make them ourselves. After some experimenting, the pins were made from the ⅛-in. rawhide pins used in connection with a certain kind of belt fastener, in this manner: An anvil piece arranged with a flange to be held in a vise, as indicated, was made from tough oil-hardened steel. The cap, of glass-hardened tool steel, slides over the upper part of the anvil, and the hole in the cap is made to conform to the final shape of the pin, the length of the latter before forming being indicated by the dotted lines. The pin is first cut to length with a pair of pliers, inserted into the opening in the cap, and the projecting end is swaged down with a light hammer.



The cap is then lifted from the anvil, and the knock-out drift shown is used for removing the pin. A production of 180 pins an hour was obtained with this arrangement.—Burr Bennett, Honesdale, Pennsylvania.

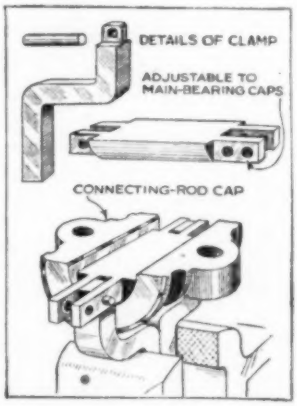
A Convenient Triangle for Draftsmen

The drawing shows a draftsman's triangle made from an ordinary 45° angle, so that a number of other angles are obtainable. One angle is cut away as shown by the dotted lines; a good way to do this being to mark off the 30° side, and then cut slightly outside the line, finishing to the line with a smooth file. The angles obtainable with such an instrument are 15, 30, 45, 60, 75, and 90°, which are produced by placing it against the T-square in different positions. The 15° angle is particularly convenient for designing 15° threads, which ordinarily requires the use of two triangles.—E. S. Brown, Hannibal, Mo.



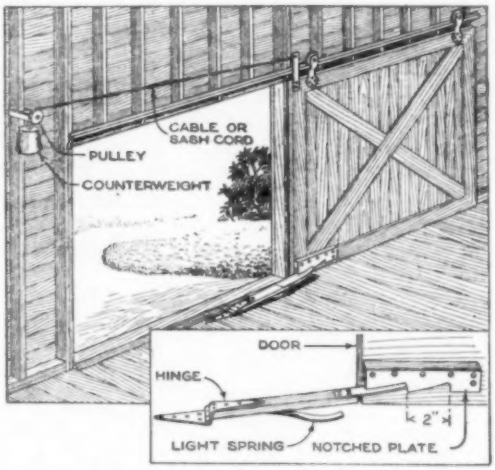
Clamping Connecting-Rod Bearings in Vise

Connecting-rod and main-bearing caps are frequently longer than the opening between the vise jaws, making it difficult, if not impossible, to grip them when filing the face for bearing adjustment. The adjustable holder shown in the drawing permits such bearings to be held securely when the face is being filed, so that a smooth, flat surface is obtained, and the rocking about in the vise jaws is overcome. The attachment also permits chamfering of the edges of the babbitt for oil channels with the one setting of the cap in the vise. The holder consists of three pieces of forged steel: the semicircular clamp and the two Z-shaped pieces. Adjustment is obtained by the holes in the end of the horizontal clamp.



Garage Door Closed by Passage of Car

Any easy-running garage or barn door may be arranged, as shown in the drawing, to close itself as soon as the rear wheels of a vehicle pass over the tripping device. The door is counterweighted so that, when the trip is released, the weight pulls the door shut. The trip, or release, consists of a hinged plank arranged, as indicated, to engage with the notched plate on the door; this plate has two notches, one of which engages with the plank in the extreme open position. A spring on the underside of the plank holds it in engagement with the notches. In operation, the front wheel of the vehicle pushes the trip down and the door is released until the catch engages in the second notch, which is about 2 in. back of the first. The rear wheel disengages the catch from the second notch and the door rolls shut. The door travel should be adjusted so that it will clear the car as it shuts.



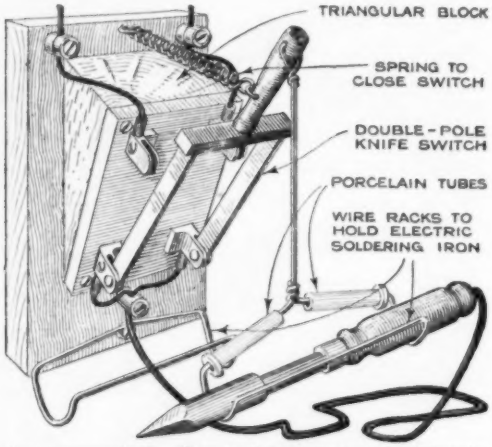
A Simple Device That Automatically Closes Sliding Garage Doors after the Passage of a Vehicle

Fruit Trees Protected from Cold

A successful method of protecting fruit trees from being killed during the winter is to bind adjacent branches together. The branches are wrapped with a heavy layer of excelsior which is covered with burlap and sewed. The idea is to protect the fruit spurs as much as possible; the branches should not be crowded too closely. The "bedclothes" are removed in the spring, after danger of frost has passed, and the tree is then cared for in the usual manner.

An Automatic Soldering-Iron Switch

A rack and automatic switch for an electric soldering iron that not only holds the iron when not in use and the current



An Automatically Operated Switch for the Electric Soldering Iron That Makes for Convenience and Economy in Operation

is off, but provides a safe place to leave it while it is heating up, or while arranging the work to be soldered, can be used to advantage in the well-equipped shop.

A double-pole knife switch is attached to the underside of a triangular block, which is mounted on a base, as shown in the drawing. The switch handle is attached to one end of a coil spring, the opposite end of which is fastened to the switch mounting in such a manner that the tension of the spring always keeps the switch closed. A stiff-wire rest or rack, formed as indicated, is suspended from a hole drilled near the end of the switch handle. In forming this rack, two porcelain tubes are placed as shown, to protect against possible contact with the switch which would short-circuit the line and blow a fuse, if nothing more serious. A similar rack is also made and attached to the bottom of the block, to form a support for the iron while the current is on and the iron is heating, or while the work is being arranged. When the weight of the iron is resting on the rack attached to the switch handle, the switch is opened and the current cut off. The front of the block should be covered with sheet asbestos to prevent possibility of fire that might be caused by overheating of the iron while in the lower rest.

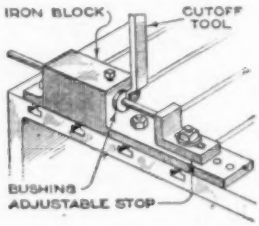
¶Run-over rubber heels can be straightened with an emery wheel or rasp.

Muffled Hoofs for Horses' Safety

The muffling of horses' hoofs has long been associated with illegitimate aims and objects, as, in the past, muffling was part of the technique with which every shady individual interested in horses was acquainted. But wrapping liberal thicknesses of burlap around a horse's hoofs is also a resource used by the driver when an icy spell catches him without calks or chains.—John T. Bartlett, Boulder, Colo.

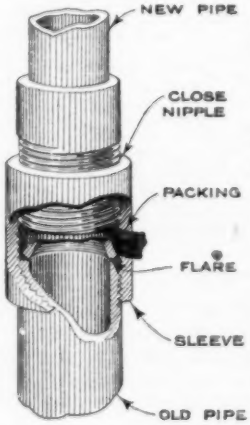
Cutting Pins in the Shaper

Where a large number of wire pins are to be cut in standard lengths, there is no easier way of doing the job than on a shaper, if one is available. A cast-iron block is provided with a tool-steel bushing, a few thousandths of an inch larger than the wire to be cut, and an adjustable stop, as shown in the drawing. The block is fastened to the shaper table, and a regular cut-off tool is placed in the shaper head, in the manner shown. Different-sized bushings may be used to take various sizes of wire, the bushing being held in place by a setscrew.



An Emergency Pipe Joint

A water pipe was to be extended, and while there were plenty of fittings at hand, dies were not available for threading the pipes. Notwithstanding this, a water-tight joint was made, as shown in the drawing. The cap was replaced by a threaded sleeve, and the end of the new pipe, which was of slightly smaller diameter than the old, was flared slightly, and packing was wrapped around the outside of the flare, as indicated. The two pipes were arranged end to end, as shown, and a



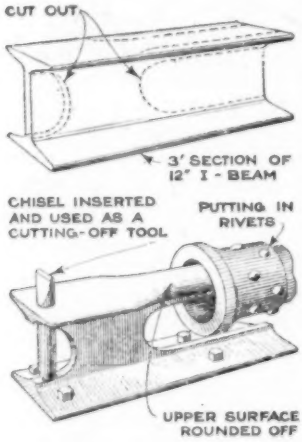
close-fitting nipple, with an internal thread to fit the smaller pipe, was screwed down tightly against the packing and the flared pipe. Plenty of white lead was used on both threads and packing.

Breaking Out a Sled from the Ice

When unhitching a sled at night, do not leave the front runners in a line with the rear ones. Leaving both sets of runners in line with each other seems to be the natural way, but it does not anticipate the "morning after," when the runners will be frozen in. A twist is what does the loosening, not a straight pull. Leave the front runners at an angle with the rear ones and then, when the sled is hitched in the morning, the pull, combined with a twist, will pry the runners loose without difficulty.

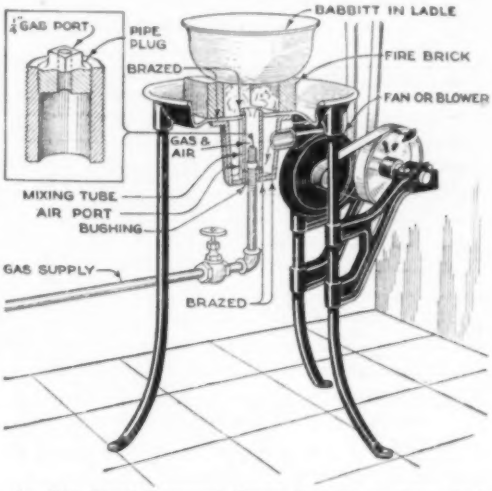
A Special Garage Anvil

The anvil shown in the drawing possesses peculiar usefulness for riveting drive-shaft and rear-axle housings of automobiles. It is made from a 3-ft. length of 12-in. I-beam. The web of the beam is cut away, as shown, for about 18 in., and holes are drilled in the bottom flange for bolting to a bench or block. The upper surface of the anvil is ground, or machined, round, to permit rivets to be inserted and supported in these comparatively small parts. The heel of the anvil has a hole drilled through it, in which a cold chisel can be inserted and used as a cutting-off tool.



A Gas-Fired Forge

Recently a small shop had difficulty in melting babbitt metal in the soft-coal fire of a portable forge. The work had to be done on the main machine floor, and the smoke was very annoying; also, the babbitt was 85 per cent tin, and required a sustained temperature of 650° F., which was difficult to maintain unless a man was kept turning the crank, and the temperature varied greatly when the fire



An Old Hand-Operated Forge Rebuilt to Burn Artificial Gas, for Melting Babbitt, Produces Exceptional Results and Holds the Heat within 10 Degrees

burned down and fresh fuel was added. It was decided to convert the forge into a gas-fired one, and this was successfully accomplished, in the manner shown in the drawing. First of all, the top and bottom of the tuyère box were closed by metal plates, brazed in position with an oxy-acetylene torch; then a mixing tube, with a reducing bushing threaded in the bottom plate, was permanently fastened by brazing. Around the bottom of this mixing tube, and just above the bushing, a circle of ½-in. air ports was drilled. The gas-supply line has a pipe plug threaded into the end and a ¼-in. gas port is drilled through its center. The end of the gas-supply pipe was threaded for about 6 in., so that it could be adjusted up or down for obtaining the proper burner height. The legs of the forge were bolted down to the floor, and after the hand crank had been removed, a pulley was put in its place, and the blower belted to an overhead countershaft. After some experimenting to obtain the proper blower speed and the correct burner adjustment, the new arrangement was put into use with exceptionally satisfactory results. It has been found possible to hold the temperature of the metal to within 10° at all times, and to raise the temperature to as high as 1,000°. The labor of turning the crank was done away with, and there were no fumes to bother the men. Even with the high price of the artificial gas used, the operating cost was less than that of coal.

Making Right-Angle Bends in Conduit

In making right-angle bends of standard radii in conduit work, one electrician has found the accompanying table

SIZE OF CONDUIT	OUTSIDE DIAMETER OF CONDUIT	STANDARD RADIUS OF ℄ OF BEND	— INCHES	+ INCHES
½	⅞	4½	5	2
¾	1 1/16	5⅜	6	2½
1	1 5/16	5¾	6½	2½
1¼	1⅝	7¼	8	3¼
1½	1 7/16	8½	9½	3¾
2	2⅜	9½	10½	4½
2½	2⅞	10½	12	4½
3	3½	13	14¾	5¾
3½	4	15	17	6½
4	4½	16	18¼	6¾

A Table Which will Prove Useful to the Lineman in Locating Right-Angle Bends in Conduit

of great assistance in locating the bend at the proper point.

An example of the use of this table is shown in Figs. 1 and 2. Supposing that ½-in. conduit is to be run from the ceiling outlet box A, across to the wall and down, as shown in Fig. 1. On a length of ½-in. conduit, lay off the distance L, Fig. 2. Under column marked "—inches" in the table and opposite ½-in. conduit, find 5 inches; and under column "+ inches," find 2 inches. From point B lay off A, 5 in. to the left, as shown in Fig. 2, and lay off C, 2 in. to the right. Then start the bend at A, and finish it at C. If the measurement L, Fig. 1, is made to the inner edge of the conduit, the diameter of the conduit must be added to the distance L, Fig. 2.

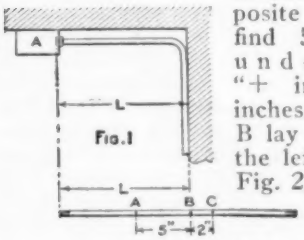


Fig. 2

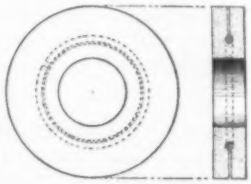
Keeping Fuel Oil Liquid in Cold Weather

In a steel plant, trouble was experienced during the cold months of the year in keeping the fuel oil sufficiently liquid to pass through the fine strainer screens. To remove this difficulty, three 500-watt electric heating units, each about 2 ft. long, were arranged around the pipe, on a spider frame, to prevent contact of the heater elements with the pipe. A section of magnesia pipe covering was placed over the heaters as an insulation. Last winter no trouble was experienced with this arrangement, and the fuel oil, though it stiffened at 40° F., passed through the piping at the rate of 30 gal. an hour, even when it entered the heater at a temperature as low as 5°.—George J. Kirkganer, Milwaukee, Wis.

Grease Leaks Cured by Spring Washer

In certain makes of cars, the owner is often annoyed by grease leaking from the rear axle, smearing the wheel, and preventing the brakes from holding.

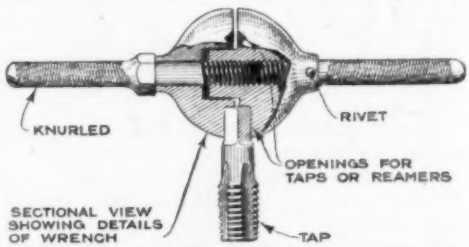
A felt washer, which will be automatically compensated for wear, and will maintain a tight joint between axle and housing, is shown in the drawing. Take a new washer and split it around the circumference, to within ¼ in. of the center hole. Coil a piece of spring wire around a shaft, about the same size as the axle, and cut off one coil for the washer. Spring the wire into the slot in the washer, and apply to the axle in the usual manner.



When fitting new washers, be sure that the axle is not rough, causing the washer hole to wear unduly; a heavy grease should be used, and care should be taken not to fill the housing above the prescribed level.—S. E. Gibbs, Urbana, Ill.

An Improved Tap and Reamer Wrench

A navy-yard machinist uses a tap and reamer wrench of his own design which is a departure from the usual type, as shown in the drawing. The central portion of the wrench is made spherical in shape, to afford a convenient grip for the palm of the hand when starting a tap into the drilled hole, thus making it possible to hold the tap centrally and causing it to take hold readily without tearing out the



A Tap and Reamer Wrench Which Affords a Comfortable Grip for the Hand in Starting the Tool

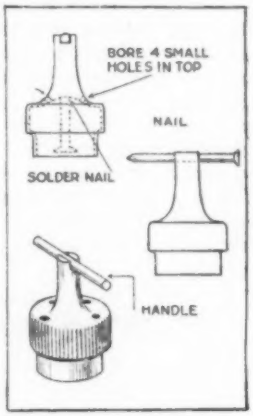
uppermost thread. Six openings for the accommodation of different-sized tap and reamer shanks are provided around the periphery, and the wrench can be used for holding almost any tap or reamer.

A Kink for Laying Shingles

The use of a single straightedge when laying shingles entails a great deal of moving around and unnecessary work, while, if three straightedges are used, the time is reduced and the job has a more finished appearance. When one course of shingles has been laid along one straightedge, do not pull it up. Take another straightedge and lay it along the upper edge of the first; lay a course along the second one, and, if desired, a third straightedge can be similarly laid down above the second. Then the first one is taken up and put down above the upper one, and so on. The straightedges are the exact width of the weather, and perfect work is the result, while by using a single straightedge there is usually a gain at one end or the other of the course. By using two or three straightedges, as described, six courses can be started at one end of the roof and then extended toward the opposite end, which is practically impossible where a single straightedge is used in the ordinary way.—Robert P. Lincoln, Minneapolis, Minn.

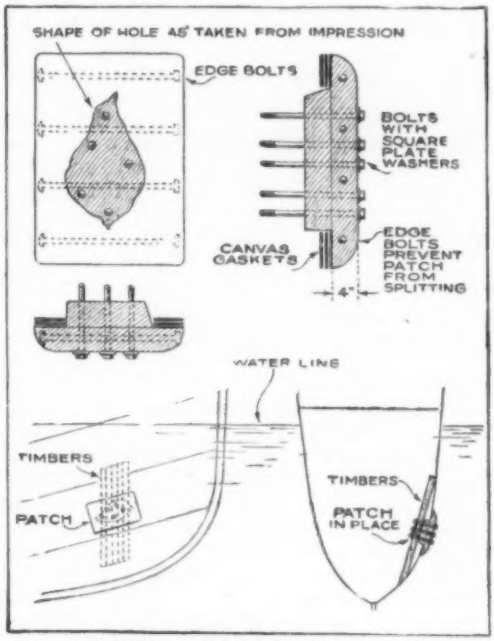
Cap for Deflating Inner Tubes

A simple appliance for holding down the plunger core of an inner tube, to deflate it, is shown here, and will be found convenient by any motorist. It is made by soldering a section of a small nail to the inside of a valve cap, so that it will press down the plunger core when the cap is screwed on the valve. The head end of the nail should be used, and filed so that it will pass into the valve easily. A second wire nail, soldered horizontally into the slot in the top of the cap, serves as a lever in screwing the cap on the valve. Holes bored in the top of the cap permit escaping air to pass freely.—L. B. Robbins, Harwich, Mass.



A Wooden Patch for a Jagged Hole in a Ship's Bottom

It has often been the misfortune of ships to have a jagged hole torn in the bottom or below the waterline from contact with a submerged pile, or from grounding and getting the fluke of an anchor through the bottom. In the absence of a marine railway, or drydock, such holes can be patched by a diver, provided the ship's bottom is high enough above the bottom of the harbor for him to reach the hole from the outside. The diver makes a mold or matrix of the hole, by using tallow, or some other substance that will retain its shape; this impression is used as a pattern for a patch that is cut out from wood to fit the opening closely. The outer part of the patch is rounded off on all sides to offer less resistance to the water, and holes are drilled through it for a proper number of bolts, with the threaded ends inside. Two or more thicknesses of heavy canvas are tacked to the edge of the patch for a gasket, as shown in the drawing.

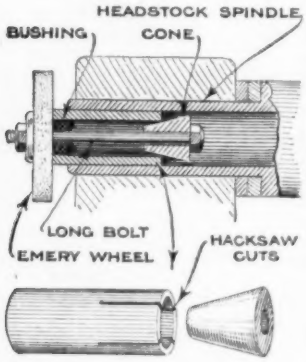


Jagged Holes in a Ship's Side, from Contact with Submerged Piling or Grounding on Its Own Anchor, are Temporarily Repaired by a Simple Wooden Patch

The patch is placed over the hole from the outside and sufficient water is pumped from the compartment to permit access to the hole, the repair being completed by bolting the patch in position against the hull in the manner shown.

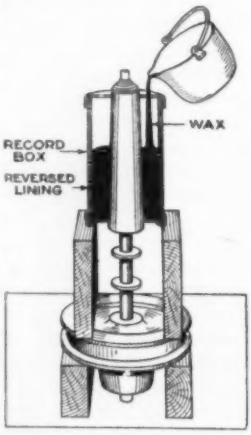
A Tool Grinder Attached to the Lathe

There are numerous cases where a tool grinder attached to the lathe, as shown, would result in economies of one sort or another. A section of tubing which makes a snug fit inside the headstock spindle is used for holding the grinding wheel to the lathe. One end of the pipe is split at right angles for about 4 in., and a bushing is shrunk or threaded into the opposite end, as a bearing for the long bolt on which the grinding wheel is mounted. The wheel is held firmly in place when the cone is drawn inside the split end of the tube as the outside nut is tightened. A scratch brush or a polishing wheel may be substituted for the grinding wheel, if desired.—Harold E. Benson, Boulder, Colo.



Making New Dictating-Machine Records from Old Records and Shavings

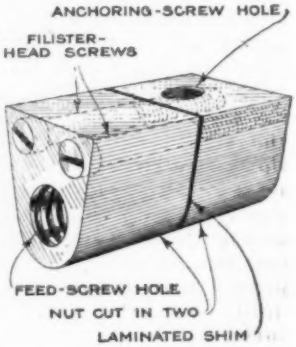
New dictating-machine records can be made from the shavings and from old records by melting the wax and pouring it into a mold, which can be made from the arbor of the shaving machine. This is removed from the machine and set up as shown in the drawing, a piece of writing paper being wrapped around it and held with a piece of cord. A piece of coarse cord may be wound spirally around the arbor if desired, to duplicate the internal grooves of the original cylinder. The outer portion of the mold is made from one of the cardboard record boxes which is held concentrically with the arbor by a hole cut in the center of the base. The fleece-lined lining of the box is removed and reversed so that the plain back is exposed to the melted wax. The shavings and pieces of broken records are placed in a saucepan and melted over a gas jet. When sufficiently fluid, the wax is poured through small openings cut near the edge of the cover.—J. R. Henderson, Montreal, Can.



Readjusting a Worn Feed Nut

To eliminate the lost motion caused by the wearing of the feed screw and feed nut in lathes, planers, milling machines, or wherever a cross-feed screw and nut may be used, the following method has been found satisfactory.

Remove the feed nut from the machine; lay out, drill, and tap holes for filister-head screws, as indicated in the drawing, using screws as large as possible without weakening the nut too much; then saw the nut in two, as near the center as possible, without coming too close to the anchor-screw hole. The sawed ends are faced off square; the gap created by the saw cut and subsequent facing is measured, and a piece of laminated shim stock of this thickness, drilled for the screws to pass through, is placed between the two halves, which are then screwed together tightly. After the exposed edges of the shim stock have been dressed down, the nut is again placed in the machine ready for service. When further wear develops all that is necessary to take up the lost motion is to remove the screws and peel off one or more of the shim laminations. This method not only produces an adjustable nut, but it is finished in less time than would be required for making a new one.



Driving Glaziers' Points

Most mechanics and all amateur glaziers find it difficult to hold the little triangular glaziers' points tightly against the glass while driving them in, for they must be driven deep enough to be concealed by the line of putty. An effective way of holding the points while driving, and, at

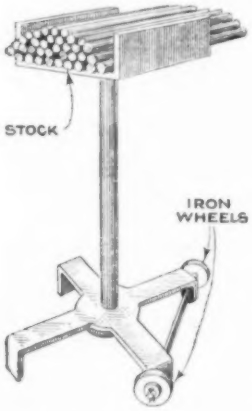
the same time, of keeping the glass pressed against the sash, consists in using an ordinary pencil equipped with a rubber eraser. The friction of the rubber against the glazing point makes it possible to slide it to any point and hold it there until driven into the sash.—C. J. Menasco, Washington, D. C.

A Cheap and Accurate Level

A water level is a very simple and useful tool, and one which should be better known. It consists of the desired length of rubber hose with a piece of water-gauge glass inserted in each end. The hose is then filled with water to within 2 or 3 in. of each end. Such a level is used for leveling floors and ceilings of new buildings. One of the glasses is placed on a given level mark on a wall or other vertical surface and the glass at the opposite end of the hose is carried to the part to be leveled. When the water in the first glass is opposite the given mark the water in the second mark is at the required level, and an appropriate mark is made. If a given point is 4 ft. below the ceiling or above the floor, measure 4 ft. from the second point, up or down, as the case may require, to get the location of the finished surface. Such a level is particularly useful for leveling from one room to another or any distance from a few inches up to 50 or 60 ft.—E. A. Weatherston, Chicago, Ill.

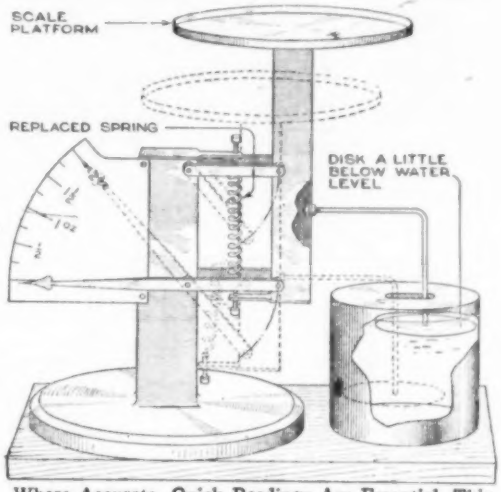
A Portable Stock Rack

A stock rack that can be taken from one location to another, but which is not too easily moved, is built as shown in the drawing. An ordinary stock rack may be converted to this purpose by adding a pair of iron wheels as indicated. The advantage of such a rack is apparent. If desired for holding work behind a machine, a stand of this type will not roll away as would one with four wheels, and yet, when it is desired to move the rack, but little effort will be required.



Making a Small Deadbeat Scale

In processes where a large number of individual weighings of small quantities



Where Accurate, Quick Readings Are Essential, This Deadbeat Scale will Prove of Considerable Value

of material is necessary, some form of deadbeat scale is essential, to combine speed with accuracy. The drawing shows how a small postal scale was converted into a low-reading deadbeat scale.

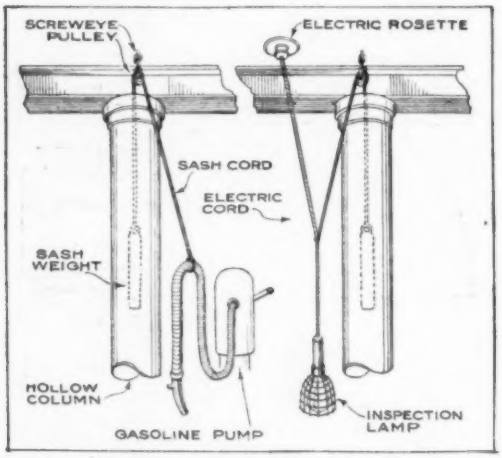
The original spring was replaced by a lighter one, and by testing with standard weights, a new scale of stiff Bristol board was carefully calibrated and placed over the original one. The readings were very accurate, but the scale was too lively and sensitive, and the pointer would vibrate for a considerable time before coming to rest and making a reading possible. This objectionable vibration was overcome by the deadbeat arrangement which brings the pointer to an instant standstill. A dashpot was arranged on the base, as indicated in the drawing. A disk of thin sheet aluminum was attached to the end of a bent piece of aluminum rod, which is fastened to the scale, as shown. The dashpot consists of a small covered can, filled with water, having a slot in the top large enough to clear the rod.—Harry Hertzberg, Brooklyn, N. Y.

Coloring Brass for Laying Out

Brass can be colored with the ordinary copper-sulphate solution used for laying out iron and steel. Some fine cast-iron filings are placed on the brass at the points to be marked. The copper solution is applied to the filings, and a deposit of copper is produced.

Hollow Columns Conceal Counterweights

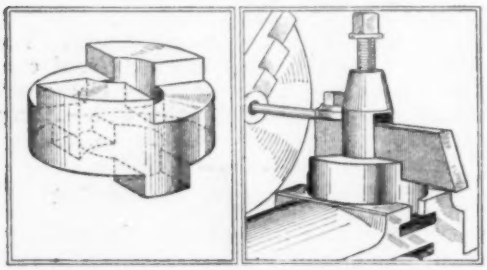
It is frequently desirable to counterweight an air line, gasoline hose, or electric droplight cable, to lift it from the floor, and for clearance. The drawing shows a method of using counterweights which are concealed inside of hollow supporting pillars. In case the weight cannot be inserted at the top of the pillar, an opening can be made in the side large enough for the insertion of a sash weight, or lead-filled pipe, a pulley being attached over the opening with machine screws.



Counterweights Concealed inside Hollow Iron Columns Keep Hose and Electric Wires Out of Harm's Way

Boring-Tool Holder

On jobs requiring the use of a long boring tool, it is important that the tool be very firmly held in the tool post, as the pressure on the cutting edge has a long leverage to force the tool back from the work. On such jobs it is also especially important that the tool be held exactly parallel with the spindle.



A Metal Block Cut to This Special Shape will Take Most of the Strain off the Tool-Post Screw When Using a Long Boring Tool

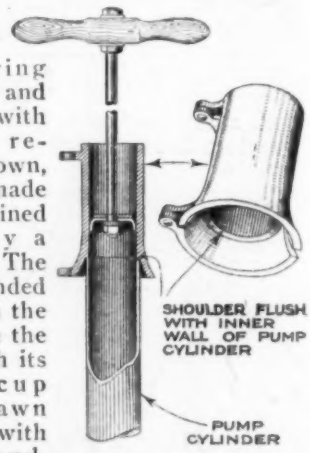
The device, detailed at the left, and illustrated in use at the right, gives a positive grip on the tool so that even if the tool-post screw should become slightly loose, the tool will continue to cut. The piece is shaped from either cast iron or mild steel, and the recesses are milled in its top side, the bottom having a tongue to fit the T-slot.—M. L. Lowrey, Livermore, Calif.

Spring Holds Apron

Considerable time is lost when one is in a hurry, in tying or untying the ordinary workshop apron, which is fastened about the waist with tapes. However, if the tape is removed and a piece of stiff clock spring, bent to conform to the waist, is inserted instead, all further troubles with the strings are removed. The spring is easily taken out when the article is to be laundered.—Forrest Benson, Boulder, Colorado.

Tire-Pump Assembly Fixture

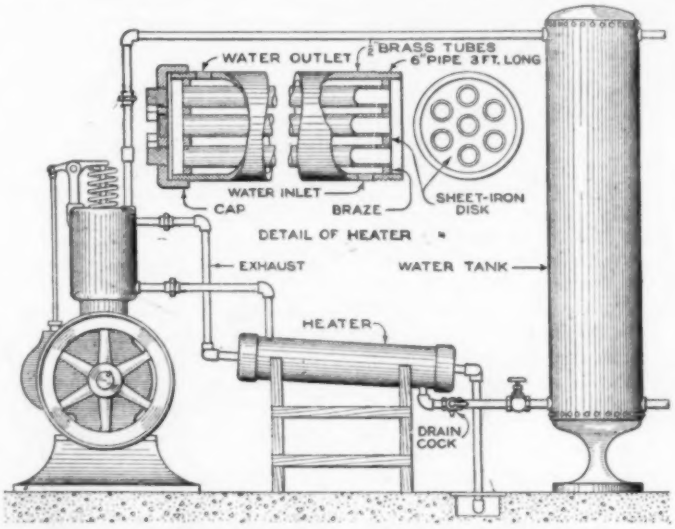
The rapid assembly of the cup leather on the piston rod of a hand tire pump was the problem that came up in a factory manufacturing pumps of this character, and anyone who has undertaken the insertion of such a leather into the barrel of a pump will testify to the difficulty of the operation. After some consideration, the assembly sleeve shown in the drawing was designed and put into use with satisfactory results. As shown, the fixture is made in two parts, joined together by a hinged joint. The device is intended to be held with the left hand while the piston rod with its attached cup leather is drawn into the fixture with the right hand, bringing the leather to the position indicated. Still holding the fixture together in the hand, it is placed over the end of the pump cylinder and up to the shoulder, which is flush with the inside walls of the barrel; then the piston is shoved down into the cylinder, placing the cup leather without a wrinkle.



An Exhaust Water Heater

A western farmer, who used a gas engine to drive a dynamo, in the basement of his house, and realized that about 35 per cent of the heat value of the fuel was wasted, utilized the exhaust from the engine to provide hot water for various domestic uses.

A section of 6-in. pipe, 3 ft. long, was threaded on both ends and provided with two pipe caps, the caps being drilled and tapped for ¾-in. pipe. Two sheet-iron disks were made to fit inside the 6-in. pipe, being drilled with seven holes each, for the reception of ½-in. brass tubes, as shown in the illustration. The sheet-iron disks were driven into place in the pipe, about 1 in. from each end, and the seven brass or copper tubes inserted and either expanded into, or securely brazed to, the disks; copper is the best material for these tubes, but brass will serve. The pipe caps were put in place and connections made to the engine exhaust as shown, the heater being mounted on a wooden support close to the engine. Holes are drilled and tapped in the body of the 6-in. pipe for the water inlet and outlet, the course of the water being in at the bottom of the heater, around the brass pipes, out at the top and around the water jacket of the engine to the top of the range boiler, and thence to wherever the hot water is to be used. The exhaust gases go through the brass tubes in the heater, down to a trench in the floor, and outside the building. All joints should be thoroughly tested before running, and unions should be placed as indicated to enable the device to be quickly disconnected. This heater effects a considerable economy by using the heat of the exhaust gases which would otherwise be wasted, and has given considerable satisfaction to the builder, who had tried several experiments before evolving this device, which has amply repaid him for his small outlay.



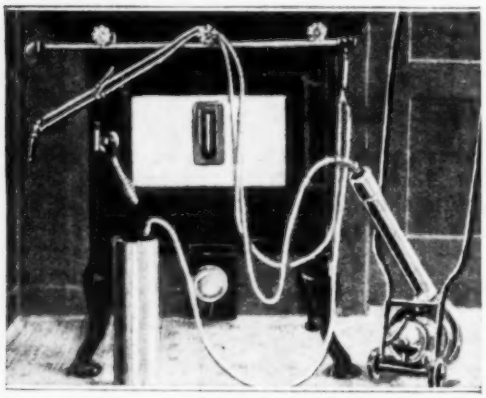
Exhaust Heater of Simple Construction Which Utilizes Heat Otherwise Wasted, and Supplies Hot Water for Various Uses around the Farm

A Glare Shield for the Reading Lamp

The effect on the eyes of the direct rays from a table reading lamp can be avoided, and a pleasing diffusion given by using a glare shield of some translucent material underneath the shade; this may be of parchment, oiled paper, or matt-surface celluloid. The shield may be supported on the shade brackets, or tape strips sewed to the edges of the shade will answer the purpose, and if such strips are applied to form a star, or other design, the appearance will be better. When the incandescent bulb can be removed without disturbing the shield, it might be permissible to sew a piece of tracing cloth or similar material directly to the edges of the shade.

Home-Brazing Apparatus

There is a fascination about accomplishing the unusual that makes working with high temperatures absorbing to the amateur mechanic. In most cases he has hesitated to undertake a job of brazing, or hard-soldering, because he lacks the facilities for producing air under pressure.



Air under Pressure, Supplied from an Electric Vacuum Cleaner, Combined with Acetylene and Illuminating Gas, Produces a High Temperature

The photograph shows an arrangement by means of which the brazing blowpipe is connected to an electric vacuum cleaner by removing the dust bag and connecting the torch to the cleaner with rubber tubing. If only light metals are to be brazed, ordinary city gas will suffice, but if heavier work is attempted, higher temperatures will be needed. To produce the higher temperature demanded, the ordinary illuminating gas is enriched by the addition of acetylene gas from a small tank of the compressed gas, which is connected to the illuminating-gas supply by a "Y," as shown in the illustration. The pressure of the acetylene can be easily regulated by the valve on the tank.—C. A. S. Howlett, Utica, N. Y.

Making Vinegar without Fruits

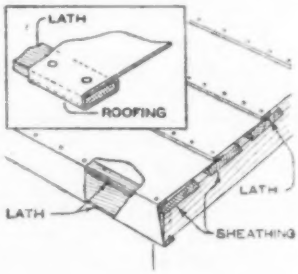
An excellent vinegar of high acidity can be easily made without the use of apples, or other fruits, by a simple process. Three pounds of brown sugar are dissolved in 1 gal. of boiling water; this is allowed to cool, and 2 gal. of cold water are added. Two slices of toasted bread are spread on one side with compressed yeast, one cake of yeast being spread on each slice. The yeast-covered toast is put into the mixture of water and sugar, which is placed in a stone crock or jar and allowed to stand for six weeks. The liquid is covered with a piece of cloth to permit the access of air. The acetous fermentation that results produces an excellent vinegar for table or pickling purposes.—Mrs. F. S. Hagans, Uniontown, Pa.

Carpet Beater Made from Old Hose

A first-class carpet beater can be made from a piece of garden hose and an old broom handle. The piece of hose, about 4 ft. long, is slipped over the end of the broom handle, which has been cut to a convenient length, and is fastened securely with tacks and a tight wrapping of wire; a groove cut just back of the end of the stick will hold the hose more securely, when the wire wrapping is applied. After it has been secured to the stick, the hose is split in three or four places, to within an inch or so of the handle; this will produce a beater that resembles a "cat-o'-nine-tails."

Laying Prepared Roofing like Shingles

Because prepared roofing is applied flat, with no lines to break the monotonous smoothness of the surface, roofs thus covered are rarely pleasing to the eye. However, roofing paper can be applied to imitate shingles in a simple manner. The strips of paper are cut in half, or smaller, as desired. Starting at the eaves, as in laying shingles, the first strip is nailed over a lath to the underside of the eave. The upper edge is drawn up tightly and tacked to the roof in the usual way; then the next course is similarly applied, using lath or other strips to raise the material and give the effect of a course of shingles. Thatch-roof effects, which are now so much in favor, can be easily obtained with roofing paper by providing a curved base at eaves and gable facings over which the paper is applied.—Edward J. Calhoun, Chicago, Ill.



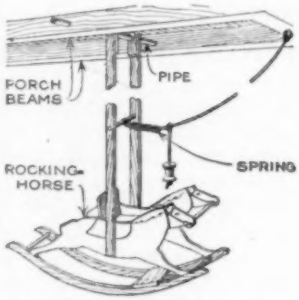
¶ A nailset is much better than the usual long, awkward-handled burnisher to turn the edge of a steel scraper.

Ricing Potatoes through a Tin Can

A potato ricer, that produces mashed potatoes free from lumps, can be made from a tin can and an ordinary wooden potato masher. The rough edge of the can is first removed by heating until the solder melts. The bottom and sides are liberally perforated by using a nail as a punch, after which the burrs around the holes are smoothed off with a file. In use, the cooked potatoes are placed inside the perforated can, and the wooden masher, which should make a close fit, is inserted and pressure applied sufficient to mash the potatoes and force them through the holes in fine streams.—Paul Gorton, Big Rapids, Mich.

Rocking-Horse Porch Swing

A child's rocking-horse chair can be converted into a delightful porch swing in the manner shown in the drawing. Two lengths of 1 by 2-in. material, supported by a piece of iron pipe, are used to suspend the rocking-horse from the ceiling. The top ends of the vertical strips are made of double thickness, to provide a better bearing on the pipe. If available, pieces of brass pipe can be used for bushings instead of the plain wood bearing against the iron pipe. By attaching a rope to the ceiling and to the swing with a light coil spring, as shown, the child is able to swing itself without assistance. The spring prevents the swing from being brought up with a sudden jerk. A large spool or wood handle is provided at the lower end of the rope for the child to grasp.—Chas. H. Willey, Concord, N. H.



Making Blueprints from Pencil Sketches

The usual method of making duplicate drawings is to make the drawing on thin paper and then have it blueprinted. If a piece of carbon paper is placed under the drawing, so that the ink from it will come off onto the underside of the drawing, a blueprint with much plainer details will be obtained.—Fred H. Quantmeyer, Westwood, N. J.

Doubling the Gocart's Capacity

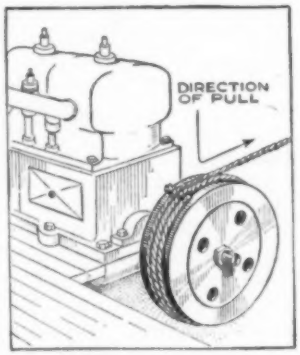
There are times when the proudest parent is not enthused at the prospect of taking his offspring for an airing, pushing one in the gocart and leading another by the hand, for the young pedestrian soon tires and demands a "lift."

Taking the Youngsters Out for an Airing is Facilitated by the Wheeled Platform Attached to the Rear of a Gocart. When Not in Use, It Folds Up

The photographs show how one father got around the difficulty; making the gocart haul two passengers instead of one, by adding a wheeled platform to the rear. This platform is attached to the rear axle of the gocart, and when not in use, it may be folded against the rear of the buggy and hooked up out of the way. —P. Sydney Tutte, Regina, Sask.

Rope Starter for Motorboat Engines

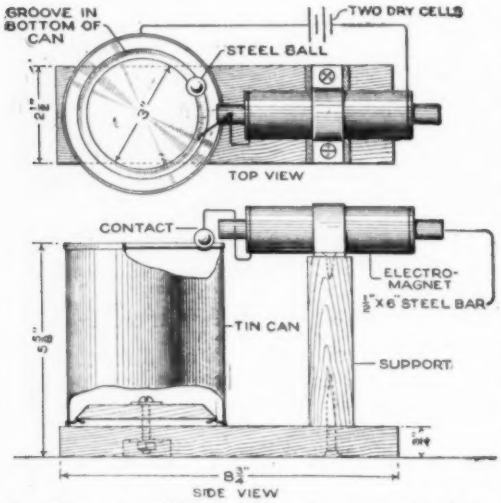
Turning over a four-cylinder, heavy-duty motorboat engine with a crank, to start it, can hardly be classed among light occupations; this is the type of engine in a number of naval launches of the present day, and it is from the navy that the trick of starting them with a length of rope comes.



A 12-ft. length of ½-in. rope is given three or four turns around the rim of the flywheel, as shown in the drawing; the end of the rope is gripped by two men, and a rapid pull will turn the engine with sufficient speed to start it, without danger of backfiring. This idea can be applied to stationary engines, tractors, and, in some instances, to automobiles.

Steel-Ball Motor Operated with Dry Cells

An interesting electromechanical toy may be made from a ½-in. steel ball, the



By Harnessing Magnetic Attraction, a Steel Ball is Made to Revolve at High Speed in a Groove in the Top of a Tin Can

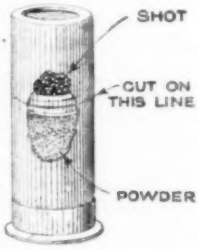
grooved bottom of a tin can, and a battery-operated magnet. The magnet consists of two layers of bell wire wound around a ½ by 6-in. iron core. It is mounted as shown in the illustration. A tin can having a circular groove, 3 in. in diameter, is inverted and fastened to the base. The battery is connected to the can, and to the far end of the magnet. The other wire of the magnet, next the can, is left bare and tied securely to the magnet bar with a string. The wire is bent to form a brush over the center of the groove, varying from ¼ to ½ in. from the iron core, which is placed as near to the steel ball as possible while still permitting it to roll by. To operate the motor, the ball is placed in the groove and given a push. As it touches the wire the current flows through the can, the steel ball, and the contact wire to the magnet. The magnetism vigorously attracts it but then the circuit is broken and the ball rolls around the can by the momentum it has gained. A continuation of the same operation keeps the ball spinning.

Waxing Brush Aids in Refinishing Floors

Tiring of a policy of watchful waiting, a housewife resolved to tackle the refinishing of her hardwood floors. From a friendly hardware dealer she borrowed a heavily weighted and long-handled waxing brush. The bolts that hold the weight to the brush were loosened, and the brush was covered with a sheet of emery cloth, the ends of which were inserted between the brush and weight and the bolts drawn up, fastening the abrasive cloth. Thus equipped, the brush was worked back and forth over the floor as in polishing, to remove the old varnish and brighten up the bare spots. After the old finish had been entirely removed, the surface was wiped clean with a dry rag, and three coats of varnish were applied at intervals of 36 hours.—Kate H. Brower, Parshall, N. D.

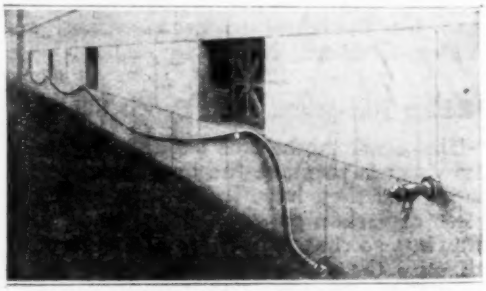
Shot Cartridges for Big Game

Once in a blue moon the small-game hunter has an opportunity to take a shot at a deer, or bear, but realizing the futility of killing the game with a scattering charge of birdshot, allows it to escape, or discreetly withdraws. One hunter successfully bagged a big black bear with a single-barrel shotgun and shot cartridges, by cutting his cartridges as shown in the drawing. When such a shell is cut, as indicated, the entire chunk remains intact until it hits and is, of course, more effective against large game. While this plan works successfully with a cylinder-bored arm it cannot be used with a choke-bore gun.—Philip G. Bernholz, E. Orange, N. J.



Supports Hold Hose When Not in Use

With the present high price of rubber there is a chance to make garden hose last longer through the idea shown in the engraving. The rack along the wall is easily constructed, and when not in use,



A Simple and Inconspicuous Rack along the Side of a Building Saves Time and Prolongs the Life of the Hose

the hose is placed on it, after being drained. The time required for placing the hose on the rack is far less than is spent in winding it on a reel.

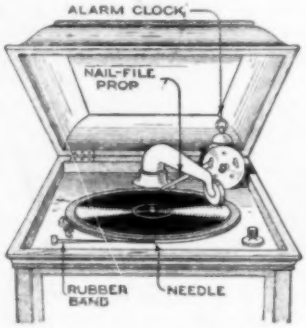
Wedges Prevent Tipping of Rôcker

Pick out the baby's favorite rocking-chair—the one he rocks so hard that some member of the family is kept busy watching to see that he does not go over backward—and fit wedges underneath the rockers, at the ends, so that they will check the rocking. The size of the wedges depends on the curve of the rocker; they may be held in place by screws or glue, and stained to correspond with the finish of the chair.

A Phonograph Alarm Clock

A novel, yet simple combination of alarm clock and phonograph, for those who would prefer awakening to the strains of music instead of the unmelodious alarm, may be arranged as shown in the drawing.

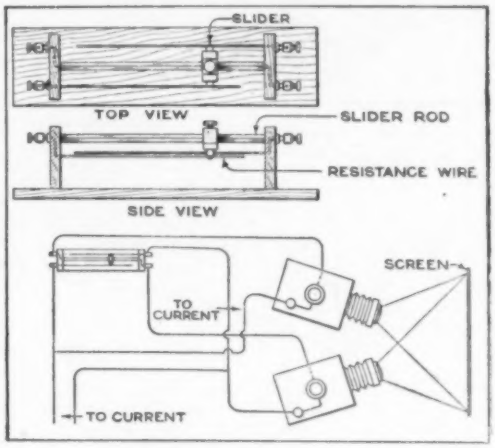
A loud record is placed on the turntable, the needle set in the first groove of the record, and the machine wound up ready for operation. The clock is set in the corner of the cabinet, with the alarm-winding key in a vertical position, and a nail file, or similar prop, is set against the key, the lower end being caught against the felt top of the turntable in a position to prevent its rotation. The stop lever on the machine is now released so that only the prop prevents it from playing. As can be seen, when the alarm releases in the morning, the alarm key turns away from the prop, allowing it to fall and thus starting the machine.



If the friction of the needle on the record prevents the machine from starting, push a needle under the felt of the turntable, leaving about 1/8 in. projecting; loop a rubber band over a thumbscrew in the cabinet top, or under a thumbtack, and stretch the other end to catch the needle as shown; this will give the necessary impulse to start the machine.—D. W. Stewart, Indianapolis, Ind.

A Switch for Producing Dissolving Views

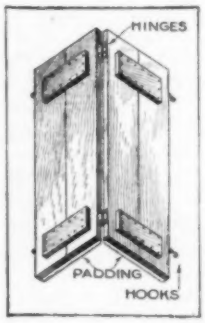
Many persons who operate postcard projectors find the alternate lighting and darkening of the screen tiring to the eyes. The drawing shows a simple switch by means of which a dissolving effect is obtained. The switch, as illustrated, is made from parts of an old tuning coil of the double-slider type. On each side of the slider rod a length of resistance wire is arranged so that it will be in contact with the slider at all times. The switch is connected to the two machines which will be required, as shown in the drawing. As the location of the slider is changed the light in one projector gradually fades, and is finally extinguished, while the light in the other becomes brighter.—Philip A. Wall, Bedford, Mass.



A Simple Sliding Switch Which Produces a Dissolving Effect for Use with Postcard Projectors

Homemade Trousers Press

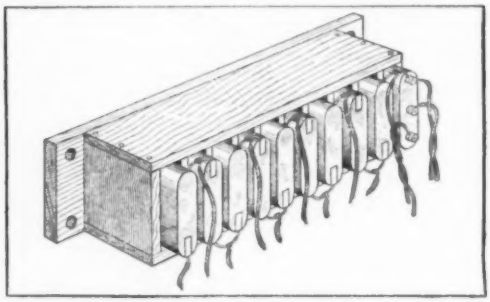
With the press shown in the drawing, it is possible to preserve the well-pressed appearance of the trousers that careful men require at a minimum of expense. With the arrangement shown in the drawing the garment, folded so as to preserve the old creases, is placed inside the press, which is held together by the hooks and provided with screweyes for hanging.—Chas. Worcester, Webster Grove, Missouri.



A "VT" Radio Panel with Navy-Type Loose Coupler

BY F. L. BRITTIN

A SIMPLE audion panel and navy-type loose coupler, which meet the requirements of the wireless amateur for apparatus that he can build himself at a minimum of expense, is described in this article. This apparatus is easy to construct and simple to operate, and its value



A Suggested Mounting for the B-Battery, Which, However, may be Mounted According to the Individual Taste of the Builder

will immediately appeal to the amateur, particularly when it is realized that such a set can be built for from 50 to 75 per cent less than it could be bought for, assembled.

The audion panel is made from a ¼-in. polished, hard-rubber panel, supported on an oak or mahogany base by angle irons, as shown in Fig. 2. The nine small holes drilled in the center of the panel allow the operator a view of the bulb when in operation. The scales on the front are scribed with some sharp instrument, and jewelers' wax is rubbed into the grooves to produce clearly distinguishable white marks against the contrasting black background. If the builder does not care to make and calibrate his own scales, he can buy graduated metal scales which can be attached to the panel, with screws, and the switch levers adjusted to correspond to the graduations. The rheostat is a small porcelain-base battery instrument, which is taken apart and back-mounted, as shown in Fig. 1, with a suitable scale on the front, as in Fig. 2. The variable condenser is of the 23-plate type, and is specially built for panel mounting; such condensers, with any number of plates, can be bought ready to mount. The fixed condenser can be bought at small expense, or one can be made from two 2-in. sheets of tin foil between three pieces of mica, with the leads soldered to the foil, or two thin strips of copper, ¾ in. wide and 2 in. long, may be used instead of the foil, which is difficult to solder.

The B-battery, shown in Fig. 1, consists of 10 three-cell flashlight batteries; nine of these are connected in series to the upper switch. The tenth battery must be opened at the top, exposing the wires which connect the three cells; lead wires are then soldered to each cell and brought down to the lower switch, as shown in the circuit diagram in Fig. 1. This arrangement gives a flexible potential control, whereby the operator can add one cell at a time, as needed. The "on and off" switch and the large binding posts for the phones are then placed. The A-battery and secondary of the loose coupler are then arranged as shown in Figs. 2 and 3.

The audion bulb is the "VT" Marconi type. A special socket is required for this bulb, which is of the bayonet type. The locations of the various leads to the bulb are indicated on the base, and it is connected with the circuit as shown. Such a circuit gives very good results, but the flexibility of the panel and the easy accessibility of its working parts, make it possible for the experimenter to use a variety of circuits with very little trouble.

The A-battery may consist of four ordinary dry cells or, preferably, a storage battery of 6-volt, 40-ampere rating. Care should be observed in wiring up the panel; each connection should be soldered and the wires neatly arranged. When completed, the panel is connected to the loose coupler, an assembled view of which is shown in Fig. 3.

The navy-type loose coupler is admittedly the best design of receiving transformer yet devised for all-around performance; this coupler will tune to 3,000-meter wave lengths, and with proper aerial and ground will receive the Arlington time signals from any point in the United States, when used in connection with the vacuum-valve panel. Nearly all spark stations use less than 3,000-meter wave lengths, so this set is adaptable for all work. How to wind and tap a loose coupler, or variometer, seems to be the stumbling block in the path of the amateur.

The primary is wound on a seamless cardboard tube, 5 in. in diameter and 7¼ in. long, ½ in. being allowed at each end for mounting. The wire used is No. 22 double cotton-covered, and the leads are taken off as shown in Fig. 4. Space off three-fourths of the coil, and take a lead off at regular intervals for the number of taps on the first primary switch. To give close tuning, leads are taken off the remaining fourth of the coil at every turn, or every other turn, as may seem desirable to the builder. It is a good plan to

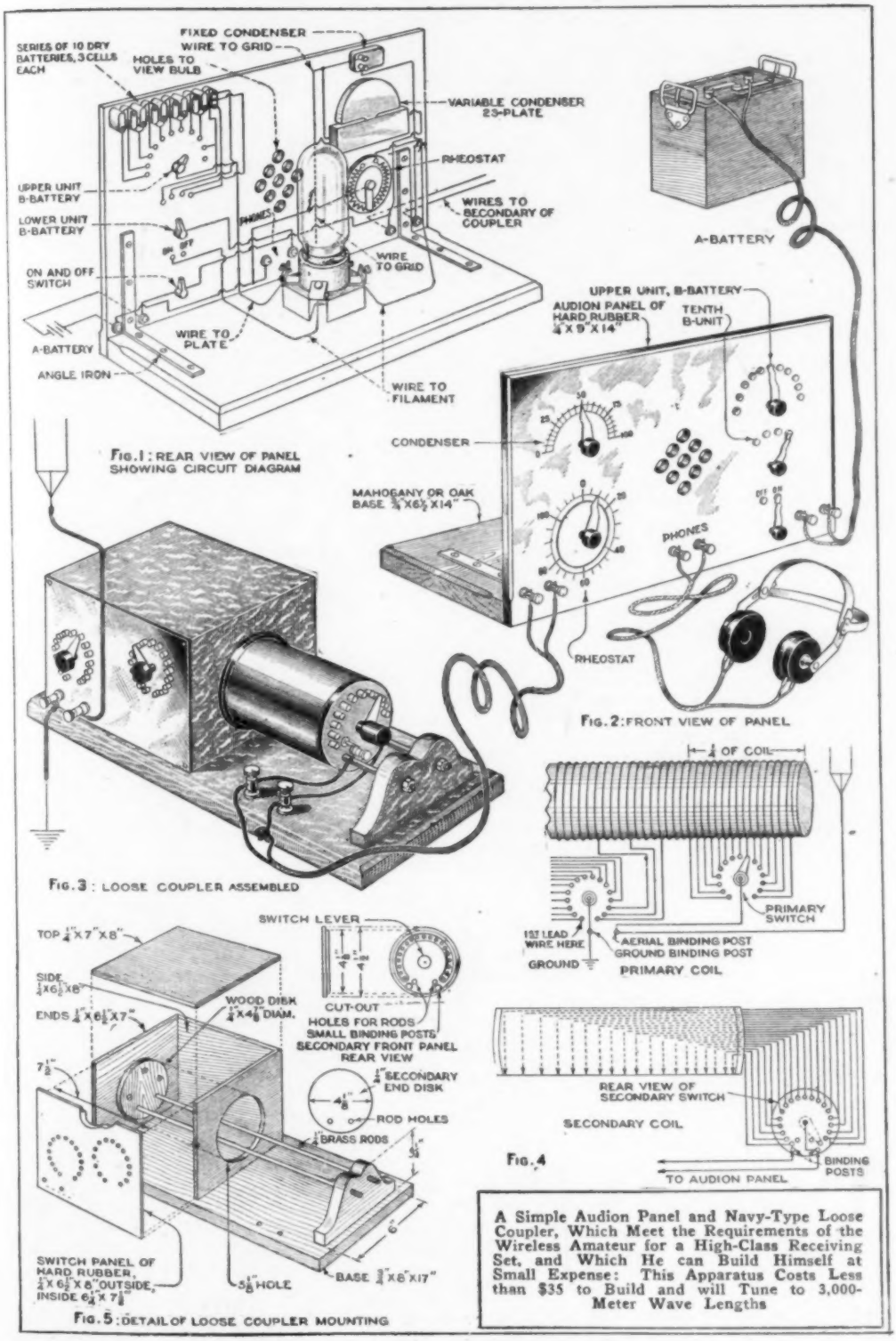


Fig. 1: Rear View of Panel Showing Circuit Diagram

Fig. 2: Front View of Panel

Fig. 3: Loose Coupler Assembled

Fig. 4

Fig. 5: Detail of Loose Coupler Mounting

A Simple Audion Panel and Navy-Type Loose Coupler, Which Meet the Requirements of the Wireless Amateur for a High-Class Receiving Set, and Which He can Build Himself at Small Expense: This Apparatus Costs Less than $35 to Build and will Tune to 3,000-Meter Wave Lengths

wind the coil full before taking off any leads; it is then easy to lift up a wire, and after scraping off the insulation, solder on the lead wire, which should be of sufficient length to reach the switch points easily.

The secondary is wound on seamless cardboard tubing, 4¼ in. in diameter and 7 in. long, using No. 28 double silk-covered wire, and is tapped 18 times, the first tap being left as a dead, or off, point. The secondary, shown in Fig. 4, is wound in the same manner as the primary, with the exception that all the leads go to one switch. Also, the lead wires are brought forward through the tube, in which holes should be punched at the proper places for the leads, before winding is commenced. The lead wires are brought through the holes in the tube in loops of correct length; these can be twisted together and the insulation scraped from the end of each length for soldering to the switch points of the secondary control switch, on the end of the coil.

The primary cabinet is made of wood, mahogany if possible, and the primary switch panel is a slab of polished hard rubber, drilled to take the primary switches and the binding posts for ground and aerial wires. The constructional details of the cabinet will be readily understood from the dimensions given in Fig. 5. The cabinet is made so that the primary coil can be mounted permanently and rigidly inside, while the secondary, which fits inside the primary, can be slid back and forth on the brass rods to obtain the proper tuning effect. The primary winding is fastened to the wood disk at the end of the cabinet with small brads, the other end fitting inside the hole in the opposite end.

Before screwing on the top of the cabinet, solder all primary leads to their proper switch points and wire the first primary-switch lever to the ground binding post, and the second lever to the aerial post, as shown in Fig. 4. The secondary coil panel, with its leads all soldered, as in Fig. 4, is then pushed into position, and the wires inside are arranged with a stick from the opposite end, so that they will not interfere with the movement of the coil on the rods. Insert the wooden disk into the rear end, and adjust the rods so that the coil moves freely in and out of the primary; then remove the rods and secure the endpieces of the secondary exactly with screws or glue. Replacing the rods and secondary, the loose coupler is ready for the flexible leads from the small binding posts on the end of the secondary; these are connected to the audion panel, ground, and aerial, as shown in Figs. 2 and 3, and the receiving station is ready for business.

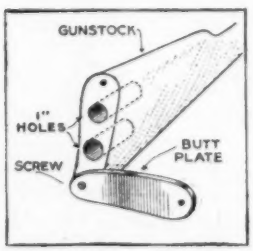
Aside from the ordinary materials of construction, the apparatus will require:

2 brass rods, ¼ by 16 in.
8 switch knobs, complete.
67 switch points.
1 23-plate back-mounted variable condenser.
1 porcelain-base battery rheostat.
8 large binding posts.
2 small binding posts.
10 three-cell flashlight batteries.
⅛ lb. No. 22 gauge double cotton-covered wire.
⅛ lb. No. 28 gauge double silk-covered wire.
1 set 2,000-ohm telephone receivers.
4 dry cells, or storage battery.
1 "VT" Marconi vacuum bulb.
1 "VT" Marconi vacuum bulb socket.

The total cost of the set, as described, will be $35 or less.

Carrying Matches in Gun Stock

Many a hunter, caught in the rain, has been compelled to spend a comfortless night, because his matches were too wet to start a fire. A reserve of dry matches can be constantly carried for use in such emergencies. One screw of the butt plate of the gun is removed, the plate swung to one side and two 1-in. holes are drilled into the stock about 2½ in. deep. The holes are filled with matches and the plate replaced. When dry matches are needed it is but the work of a minute to remove the screw, swing the butt plate around, and remove the matches.—Truman McNiel, Sask.



Gold Lacquer for Metals

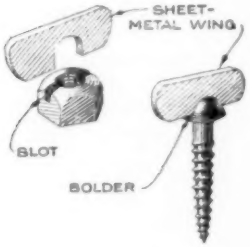
Articles of white metal, such as chains, rings, etc., may be made to appear like gold by this simple process: Boil 1 pt. of water and stir into it 2 oz. of finely powdered sulphur. Stir well, and boil up the liquid once again. Next add 1 oz. of dragon's blood. Filter through a fine cloth, to remove any solid matter that remains from the sulphur. The articles to be colored are placed, with the liquid, in a pan provided with a close-fitting lid, and boiled for about 15 minutes, at the end of which time the objects will have taken on a fine gold color.

Keeping Overshoes On in Muddy Roads

Persons who travel over muddy roads and paths experience trouble and inconvience because their overshoes become stuck, and pull off. This annoyance can be overcome by sewing a small flap, or tab, to the back of each rubber, which buttons over an ordinary shoe button secured to the back of the shoe.

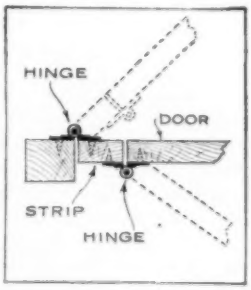
Homemade Wing Nuts and Screws

Occasionally, the amateur mechanic has use for a wing nut or screw, when none is available. If a piece of sheet brass or other stiff sheet metal is at hand, serviceable wing nuts and screws may be easily made from ordinary nuts and screws, as shown in the drawing. If a wing nut is needed, the nut is slotted across the top with a hacksaw, and a piece of sheet metal, cut to fit, is set in the slot and soldered. In some cases a washer cut in half makes a good wing. If the bolt extends beyond the nut, a piece may be cut from the wing to make room for it. Similarly, wing screws may be made by setting the wing into the screw slot and soldering.



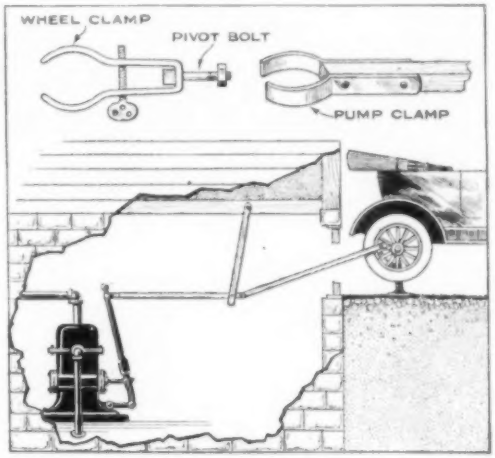
Making Double-Acting Spring Hinges

Just when a pair of double-acting spring hinges was most needed the small-town hardware dealer happened to be "out" of that particular item. Rather than wait until the stock was replenished, the customer bought two pairs of ordinary spring hinges, such as used on screen doors, and applied them for his purpose, as follows: A 2-in. strip, the length of the door, was cut and fitted, as shown in the drawing, with one set of hinges on each side of the door and on opposite edges of the strip. Both edges of the strip and door must be planed perfectly square with the face, otherwise the door will stand ajar.



Automobile-Operated Force Pump

Many farm and suburban homes are supplied with running water which is pumped from the basement with a force pump to a storage tank in the attic. The system is simple, but if any great amount of water is to be pumped into the tank the job soon becomes laborious. The drawing shows how an automobile was arranged to operate the pump. A simple pump jack, made of hardwood strips, was arranged as shown. One of the rods was brought out through a basement window and attached to one of the rear wheels of the car by means of the clamp shown in the drawing. The rear wheel of the car is jacked up from the ground, the engine thrown into gear, and run at a slow speed. The clamp which attaches the pump rod to the wheel should be long enough to clear the hub cap of the wheel.—G. E. Hendrickson, Argyle, Wis.



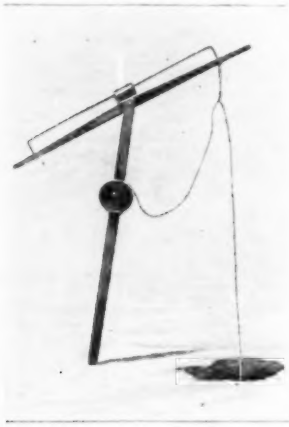
Pumping Water from the Basement to a Storage Tank in the Attic is Made Less Laborious by Harnessing an Automobile to the Pump

Water Rheostats in Series

A simple water rheostat can be made from two dry-cell carbons, held about 3 in. apart by a clamp made from two strips of wood, stove bolts being used at ends and center. The carbons are immersed in a glass jar filled with salt water. The binding posts on the carbons provide a quick and convenient means of connecting the resistance to the circuit. A battery of such rheostats can be made, and the required amount of resistance obtained by connecting them in series to a switch having a point for each rheostat. —Chas. Waller, Montreal, Que.

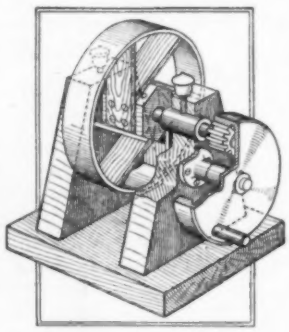
A Tip-Up for Winter Fishing

A tip-up for fishing through holes in the ice is of considerable convenience to the fisherman, as a number of such devices may be set and looked after at one time. The tip-up shown in the photograph is made by joining two hardwood sticks at right angles to each other with a small bolt, so that the cross-piece swings freely; one end of this piece is painted red and the other black. The lower end of the vertical stick is sharpened. A bicycle spoke is bent, as shown, and fitted into holes drilled in the crossarm, to which it is attached with small nuts. A sliding weight on the wire keeps the crossarm from tipping downward until a fish takes the hook and runs off with the line. The reel to accommodate additional line is a refinement that may be added or omitted as desired.—Harry F. Blanchard, S. Glens Falls, N. Y.



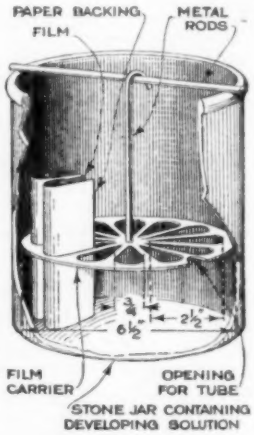
Hand-Power Device Made from Old Lawn Mower

For operating small machines, such as grinding and polishing arbors, electric generators, and the like, an efficient hand-power device can be made from an old lawn mower, as shown in the drawing. The gears from one end of the cutter are removed, and the smaller one is attached to a shaft of suitable size with a pin, or key; this shaft is supported by wooden uprights, as indicated, and turns in bearings made of brass tubing. The large internal gear is mounted on an arbor, so that the teeth of the two mesh properly, and a handle, for turning, is provided, as shown. A flat or grooved pulley of suitable dimensions is attached to the shaft between the uprights, for transmitting the power to the machine to be driven. With a device of this character comparatively high speeds are obtainable.—James P. Lewis, Golden, Colo.



Holder for Developing Cut Films

A film-pack developing tank may be easily and cheaply made from a stone jar and a metal carrier for the films. The film carrier is made from a disk of some stiff metal, preferably aluminum, on account of its resistance to corrosion. A hole is drilled at the center of the disk for the lifting rod, and 12 openings, such as shown in the drawing, are made for holding the films. The individual films are placed in the openings of the carrier, which is then lowered into the jar containing the developing solution, and moved up and down several times to break up any air bubbles that may adhere to the surface of the films; then the lifting rod is hooked over the other rod, and the development is allowed to proceed. The films are put into the openings of the carrier so that the film is inside and the black-paper backing outside, against the sides of the opening. The carrier shown in the drawing will hold a dozen 4 by 5, 3¼ by 5½, or 5 by 7-in. films; but may be made to accommodate any size films by enlarging or reducing the size of the openings. Such a tank will develop, fix, and wash the films. The developing and fixing baths are removed by turning the jar on its side, and the washing is best done by running water from a faucet through a tube to the bottom of the jar. A round hole, the size of the tube, may be cut in the film carrier if there is insufficient space between the side of the jar and the carrier.



¶Saddles should be suspended from the horn, or placed on a saddle rack, to prevent bending and twisting of the skirts and straps.

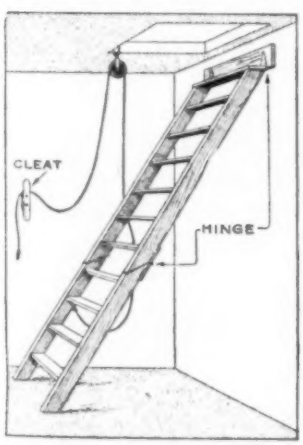
Hanging Poultry-House Doors

Most builders of poultry houses err in making the doors too narrow and locating them too close to the floor. The door should be not less than 4 ft. wide, so that a wheelbarrow can be used at cleaning time, and at least 1 ft. above the floor level; if it is near the floor, litter accumulates behind it and there is difficulty in opening and closing it.

The wide door, opening outward, can be supplemented by a netting-covered door just within. In summer, and during favorable winter weather, the solid door can be hooked back and the screen door used to brighten up the interior and permit an airing. Double-acting hinges on poultry-house doors are becoming justly popular, and are certainly a great convenience for the attendant with his hands full, as they are likely to be at feeding time. An overhead pulley and a weighted rope make a simple closing device. The attendant pushes the door open, in whichever direction he is headed, and the weight closes it after him.

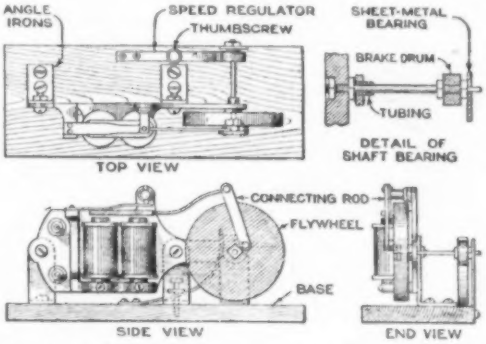
Folding Attic Steps

The steps shown in the drawing are particularly serviceable when the opening to the attic is located in a closet, or small room, where there is insufficient space for swinging a full-length ladder to the ceiling. The upper end of the steps, or ladder, is attached to the wall with hinges, as indicated. The side rails are sawed in two near the middle, the cut being made in a diagonal direction to afford a longer bearing and to bring less strain upon the strap hinges by which the sections are joined. By means of a rope and pulley, the lower section is folded inward against the upper section when the steps are drawn up. The steps are held in the raised position by taking several turns of the rope around a cleat on the wall.—C. H. Patterson, Pomona, California.



Motor Made from Electric Bell

An entertaining and instructive electric motor can be made from an ordinary electric doorbell, and while it is not at all powerful, it will run at high speed when properly adjusted. If possible, procure a bell with a wooden back, as such a back is easier to attach to the base. Set the bell on the base, edgewise, with the hammer, or tapper, up, and secure with screws through the base. If a wooden-backed bell is unobtainable, a bell with an iron frame may be attached to the base by using angle irons, as shown in the drawing. Remove the bell and bell post, and substitute a small piece of metal tubing where the post pierces the board; in the case of an iron-frame bell, a hole will first have to be drilled through the casting. Then cut out a wooden flywheel of about the same diameter as the bell, and run a piece of stiff steel wire through the center for a shaft; this wire should be of a size to fit easily in the tube. The other end of the shaft is supported by a sheet-metal bearing, fastened at the rear of the base and drilled with a hole, near the top, to accommodate the shaft. Rivet the end of the shaft slightly to prevent it from pulling out, or drill a hole through it and insert a pin, or piece of wire. Before setting the shaft in place, a brake drum made from a small spool, or disk of wood, is forced on in the position shown. Then arrange a strip of spring brass to the base, so that it will not quite press against the brake drum; a thumbscrew may be added for holding the spring against the drum, if desired. The hammer is next flattened on both sides, and a small hole is drilled through its center; this is then connected to a screw which is placed near the center of the flywheel by means of a sheet-metal connecting rod, as shown. Determine

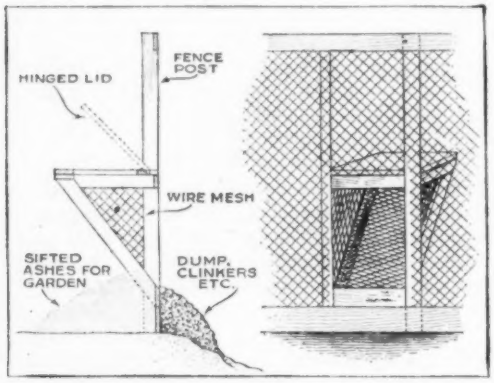


An Ordinary Electric Doorbell is Converted into an Entertaining and Instructive Electric Motor by Means of a Few Simple Alterations

how far the hammer will move when attracted by the magnets, and then place the screw just half this distance from the center of the wheel; it may be possible, by adjusting the tension of the spring, to obtain greater freedom of armature movement. Such a motor will operate on one or two dry cells, and will provide sufficient power to operate small mechanical toys.—L. B. Robbins, Harwich, Mass.

An Automatic Ash Sifter

The soil in some localities contains a great deal of clay, and the automatic ash



An Automatic Ash Sifter Which Deposits the Clinkers outside the Garden and Leaves the Sifted Ashes Inside for Application to Clayey Garden Soils

sifter shown in the drawing will prove of considerable help to gardeners in such places. It is built into a fence at the rear of the garden, and, as shown, consists of nothing more complicated than an inclined screen. In use, the ashes from the furnace are dumped into the opening inside the fence, and the fine ashes are automatically deposited in a pile underneath, while the clinkers and cinders are deposited outside.—Chester Disque, Covington, Ky.

Mystifying Transformation of Water into Ink and Wine

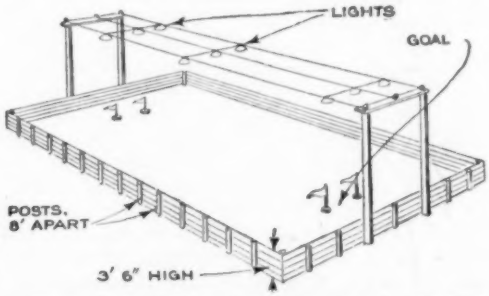
Seen by the audience, the magician exhibits a pitcher of water and drinks some of it to show it has not been "doctored." Eight empty water glasses are arranged on a board across two chairs. The magician pours water into the first glass and it remains water, but when water is poured into the second it turns inky black. The third glass will remain clear, and the fourth assumes the appearance of ink. The contents of the four glasses are poured into the pitcher and all has the aspect of ink. The magician then pours the "ink" into glasses 1, 2, 3, and 4. He pours the inky fluid into the fifth glass and it turns to water again. He pours all back into the pitcher and all is water. The first five glasses are filled with the water, but in the sixth it changes to the appearance of claret wine. The contents of all six glasses are poured back, and he has a pitcher of wine. The first six glasses are filled with the wine-colored fluid which turns to water when poured into the seventh glass. The liquid is again returned to the pitcher, and all is water again. All eight glasses are filled with water from the pitcher and no change occurs in any but the last, the water assuming the appearance of ink.

The preparation is simple. Glasses 1 and 3 are unprepared; glasses 2 and 4 contain 10 drops of a strong solution of ferric chloride; glass 5 contains 10 drops of a saturated solution of oxalic acid; glass 6 has 10 drops of ammonia; glass 7 holds 60 drops of sulphuric acid, and the last glass contains a teaspoonful of tincture of resin, made by dissolving resin in alcohol. The chemicals are all poisonous and should be carefully handled.

The operation is also simple. Fill the first four glasses, pour them back; fill the first five, pour them back; fill the first six and return to the pitcher, and then fill all eight glasses.—Frederick C. Davis, St. Joseph, Mo.

Arrangement of Hockey Rink

A hockey rink that can be used for either day or night games is arranged as shown in the drawing. The inclosure is 140 by 80 ft., and a 3½-ft. fence is built around all four sides, the posts being set



Layout for a Hockey Rink That can be Used by Day or Night, Electric Lights being Provided for Night Play

about 8 ft. apart; these are either set into the ground or frozen solidly into the ice. The goals are 120 ft. apart, and each is illuminated by three electric

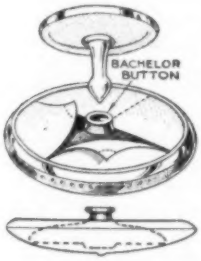
lamps, other lamps being provided as necessary to give sufficient illumination for night play.—C. L. Meller, Fargo, N. D.

Protecting Hardware When Painting

The handy man around the house cannot be expected to possess a journeyman's skill at every trade he turns his hand to, and this is particularly true of a home painting job, the difficulty consisting in applying the paint without running it over onto the hardware, such as locks, knobs, and hinges. Vaseline will enable the ambitious but unskilled painter to avoid this. A coating of vaseline is applied to the part it is desired to protect; when the paint has dried on the woodwork, the vaseline is removed with a cloth, and at the same time any paint that may have been inadvertently applied. —John T. Bartlett, Boulder, Colo.

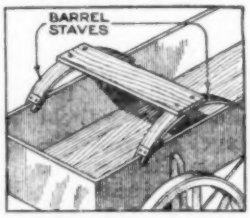
Repairing Uniform Buttons

Metal buttons such as are worn on the uniforms of firemen, members of train crews, and others, sometimes lose connection with the soldered eye, and the button is worthless. Such broken buttons are easily repaired and restored to usefulness. As shown in the drawing, the metal back is cut into four segments, which are turned back to permit the insertion of an ordinary "bachelor" button. The metal flaps are turned down and the button is affixed to the coat in the same manner as the bachelor button.—A. Peltier, Edmonton, Alta.



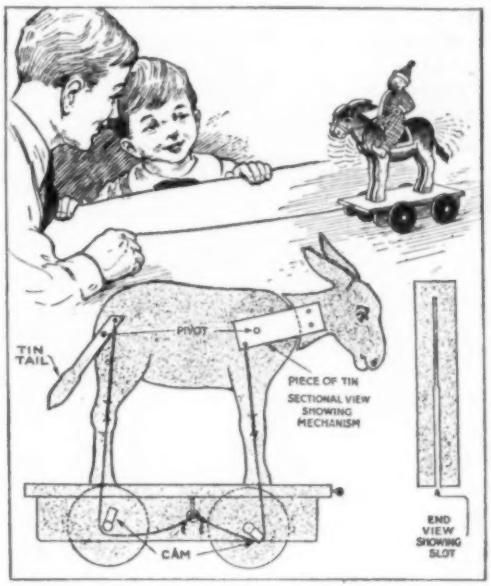
Wagon Seat Made of Barrel Staves

A comfortable wagon-box seat can be made from a wide plank and two stout barrel staves, as shown in the drawing. The plank, which forms the seat, should be about 2 in. longer than the width of the box, and is secured to the two staves, as shown. Notches in the ends of the staves, strengthened by lateral braces, serve to hold the seat securely to the box.



Toy Donkey Nods and Wags Its Tail

The most popular toys are those that move in imitation of some well-known



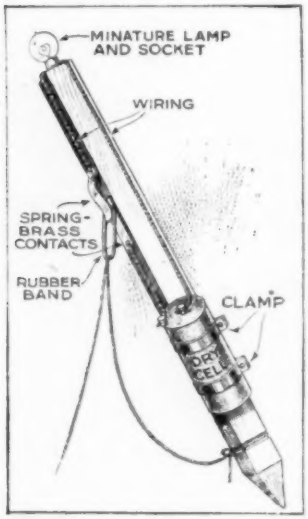
A Toy Donkey That Wags Its Tail and Nods Its Head, When Drawn across a Table, Has a Simple Mechanism That Makes It Easy to Construct

object, and the donkey, shown in the drawing, that wags its tail and nods its head, is a good example of these. The outline is drawn on a ¾-in. block and sawed out with a scroll, band, or coping saw, and the head is sawed off, as indicated. A slot is then sawed up through the legs and part way into the body. A similar, but narrower, slot is cut in the back of the head, and a strip of tin is used to connect the head to the body, as shown. A piece of tin, cut to the shape of a tail, is similarly attached in the slot behind; both the tail and the tin strip which connects the head to the body are pivoted to the latter with small brads. Motion to the head and tail is imparted by wires which connect the parts to a screweye underneath the wheeled base on which the figure is mounted. Flat strips of wood with rounded edges, which are attached to the revolving axles, strike the wires as the toy is pulled across a table and cause both head and tail to move up and down. The animal may be decorated as desired.

¶Grinding two pieces of smooth glass together, using fine valve-grinding compound, will make a good grade of ground glass.

Alarm for Ice Fishing at Night

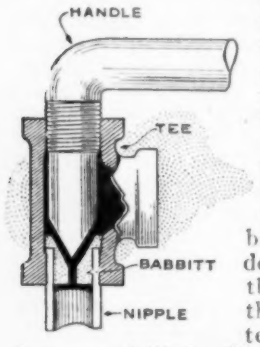
Fishing through holes in the ice, at night, when ordinary signal flags or tip-ups are invisible, is possible with the electrically illuminated device illustrated.



As shown, a round stick of the desired length has a miniature lamp and socket attached to the outer end, and this is connected to a dry cell, which is clamped near the lower, pointed end. Spring-brass contacts are secured to the stick with screws, as shown. In use, the device is propped over a hole in the ice; the line is set to pass through a rubber band which separates the contacts, but as soon as a fish takes the hook the band is pulled out from between the contacts, and the lamp is lighted.

Needle Valve Built in Pipe Tee

Not being able to obtain a needle valve of the size desired, a young mechanic turned out a satisfactory substitute from a standard pipe tee. A short nipple, provided with a loosely fitting wooden plug, was screwed into the tee, which was filled with melted babbitt to the point desired. The plug was then removed from the nipple and a center hole of the proper size was drilled. Using this hole as a center, the tapered needle seat was drilled out with a 60° countersink. The needle consists of a piece of iron rod sharpened to a point and threaded to fit the tee. The rod is bent at an angle to form a handle.—F. B. Pinkus, Pasadena, California.



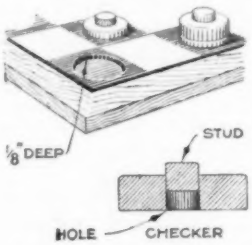
Sewing Machine Perforates Wallpaper

Wallpaper borders are very often not perforated sufficiently to obviate danger of tearing, and in some cases are not perforated at all. By running the border through a sewing machine, of course without any thread in the needle, the perforation may be successfully performed. A heavy needle should be used, and may be broken off just above the eye, and repointed, to provide additional strength. This method may be used for any purpose in which perforated paper is required.

Checkerboard and Checkers

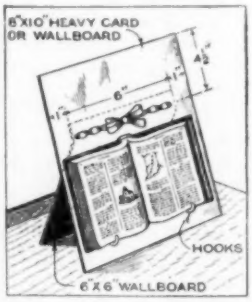
The principal fault of the ever popular game of checkers, or "drafts," is the ease with which the pieces become disarranged on the board, but with the checkers and board arranged as in the drawing this trouble is removed.

One-eighth-inch deep holes, of the same diameter as the checkers, are drilled on the black squares of the board. The checkers themselves are made with a small projection, or stud, on the upper surface. Ordinary checkers may be altered by drilling a hole through their centers and inserting a short dowel, leaving a depression in the bottom of the piece to accommodate the stud of the bottom checker when a "king" is made.



Homemade Book Rests

To encourage a proper sitting posture, the authorities of a western school furnished inexpensive material which was made into book rests by the pupils themselves. These rests were made from two pieces of stiff card or wallboard, the pieces being held together with ribbons. Strong wire hooks, inserted through the rest, serve to hold the book in an open position. The completed rests were decorated with original designs by the pupils.

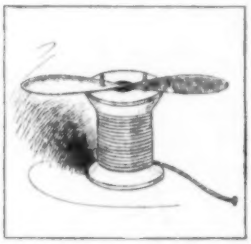


Leaf Impressions in Natural Colors

Fine impressions of leaves from trees, or other plants, in natural colors can be obtained by a simple process. A leaf is placed on a sheet of paper, and covered with a piece of linen cloth that has been soaked in spirits of niter. Another sheet of paper is placed on the linen, and a heavy book on top of that. About a day is required to transfer the coloring matter in the leaf to the paper underneath. To heighten the colors, a little varnish is brushed over the print. Note paper and menu cards can be decorated in this manner. The process can be used with either green or frost-colored leaves.—S. Leonard Bastin, Bournemouth, England.

A Simple Aerial Toy

An interesting little toy that involves no more than a small piece of tin and an empty thread spool can be made in a few minutes. Two small wire brads are driven into one end of the spool, at diametrically opposite points, and the heads are clipped off, leaving studs, ¾ in. long. A "whirler" is made from a piece of tin in the form of an airplane propeller, the blades being bent in opposite directions, as indicated.



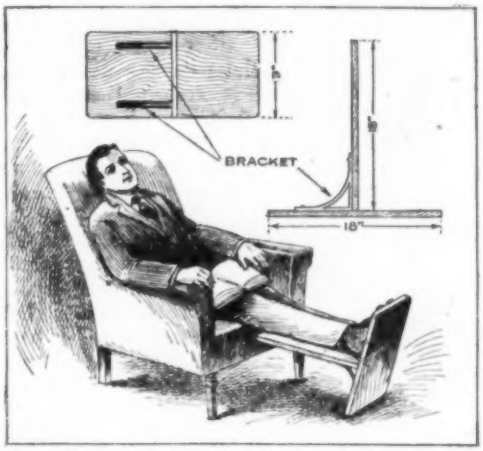
Holes to permit the propeller to make an easy fit on the studs are provided at the proper points. In use, the spool is placed on a shouldered stick, slightly smaller than the hole of the spool; then about 4 ft. of strong twine is wrapped around the spool and the propeller is placed on the studs. Holding the spool by its shaft, in one hand, the string is given a sharp pull, and the propeller flies off into space. —Floyd W. Sanders, Thomasboro, Ill.

Old Cans Prolong Stovepipe's Life

A rather novel utilization of old tin cans consists in using them for stovepipe linings to prolong the life of the latter. The tops and bottoms of the cans are removed by heating, and the seam at the side is opened up, retaining the original curvature; the cans are slipped inside the stovepipe and serve to protect it from the action of the heat and gases passing through it.—Thos. W. Benson, Philadelphia, Pa.

Easily Made Footrest

A comfortable and easily made footrest is made from two pieces of ¾-in. board

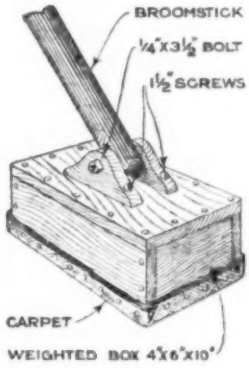


No Effort is Required to Hold This Easily Made Footrest in Position. Two Boards and a Pair of Metal Shelf Brackets Are the Materials Required

and a pair of metal shelf brackets. The two boards, each 9 by 18 in., are screwed together at right angles to each other, and the shelf brackets are attached underneath, to strengthen the construction. All corners of the boards are rounded off smoothly, and the whole is given a coat of paint, varnish, or stain, as desired. The footrest is used as shown in the drawing, and no effort is required to hold it in position.—E. Nesbitt, Quebec, Can.

A Homemade Floor Polisher

A weighted polisher for finishing hardwood floors can be made with little difficulty as indicated by the drawing. A box, large enough to hold one or two bricks, is made from 1-in. lumber. The inside of the box may be filled with melted lead, if available. The handle is held to the top by means of wooden brackets and a bolt which passes at right angles through the lower end of the handle.



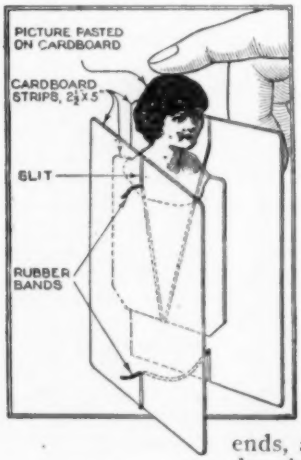
The polishing surface is formed by folding several thicknesses of old carpet over the face and tacking the edges to the sides, as shown.

Getting Music from Pumpkin Stalks

Hollow leafstalks of pumpkin vines can be made into musical instruments, the quality of the music depending, of course, upon the talent of the user. The leaf is stripped from the stalk without breaking off the small end, which is closed; then the stalk is scraped to remove the "stickers" and a "reed" is formed at the upper end by making a knife slit, as shown. By using stalks that vary in length and thickness at the large end, it is possible to vary the tone of the "instrument" to almost any degree. Successful results depend altogether on the manner in which the "reed" is cut. Some practice will perhaps be required before the knack of doing this is acquired. Finger holes are also cut into the stalk, as shown. In use the instrument is played in the same manner as a clarinet, or any other reed instrument.

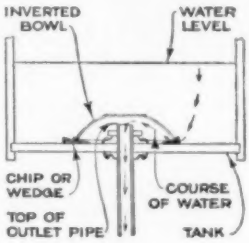
Jumping Toys from Magazine Pictures

Jumping jacks without boxes that will provide endless entertainment for the juvenile members of the household can be made from no more elaborate materials than a few strips of pasteboard and some rubber bands. Three strips of stiff cardboard, uniform in size, are required to make one of the toys. Two of the strips are placed together, and slits, about ½ in. deep, are cut in both ends, as shown in the drawing. Two long rubber bands are required; these are cut open at one end, and the ends are inserted in the slits of the opposite cards, as shown. Only one rubber band is used at a time, the other one being provided for use in case the first breaks, when the toy can be turned upside down and used without interruption. The third card has a suitable picture pasted at one end, and the cardboard is cut away around the edges of the picture. Hold the toy in the hand and insert the strip containing the picture at the top; press down against the rubber band in the manner indicated. When the pressure of the hand is relieved, the tension of the rubber band against the bottom of the picture causes it to jump out above the upper edge of the strips.—E. K. Wehry, Cedar Rapids, Ia.



Bowl Siphon for Draining Tank

When a large tank was to be drained, it was found that about 6 in. of water, which was below the level of the outlet pipe, could not be drawn off, and that mopping up this water would be tedious and expensive. However, by the application of the siphon principle, shown in the drawing, all but a very little of the water was drained out of the tank.

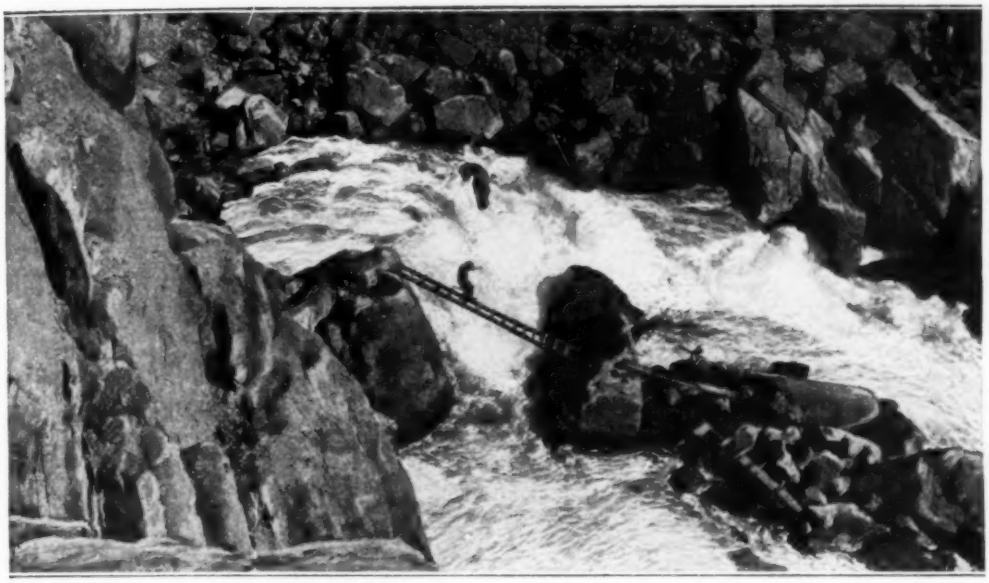


Three wedge-shaped pieces of metal were laid on the bottom of the tank, at equal distances around the outlet pipe; then about 2 ft. of water was run into the tank, and an ordinary washbowl was inverted over the outlet pipe. The rim of the bowl was supported, about ½ in. above the tank bottom, by the wedges on which the rim rested, and, as the only outlet was underneath the rim of the bowl, the water was compelled to run to the lowest point, and then rise and pass through the outlet; this created a partial vacuum under the bowl and siphoned off all but about ½ in. of water, which was easily mopped up.

Making Nicotine Spraying Solution

As concentrated nicotine solutions are not always available to the gardener, and plug tobacco usually is, the latter can be used for making an effective spray for combating aphis, radish maggot, and other insect pests.

An ordinary "plug," costing about 10 cents, is steeped in several waters until its strength has been fully extracted. To the liquid obtained, water is added to make 10 gal., and this solution is used as a spray. For radish maggot and similar subterranean insects, the earth around the infested plants is saturated with the solution.



DIFFICULT AND DANGEROUS ROAD-BUILDING FEAT IN WESTERN MOUNTAINS

THE motorist, rolling in ease and security over the passes and through the cañons of the western mountains, little realizes how much of engineering skill and human energy has been expended in making safe an open way to formerly inaccessible fastnesses. It is beyond the ability of the lay mind to visualize an automobile boulevard through or over such a chaos of rock and torrent as that shown. The trained engineer has in his mind's eye a perfect picture of the finished highway before a spadeful of earth is turned. Disregarding personal hazard he goes about his work making use of such makeshift contrivances as planks and ladders bridged between slippery rocks and aerial trolleys slung across gorge or chasm. The men in the illustration were preparing a site for a bridge and were entirely unaware that their difficult task was being recorded by a camera on the cliff above.

OPPORTUNE ANNOUNCEMENTS

Whenever prize competitions mentioned on this page are conducted by a public institution, the name and address will appear with the announcement. Industrial addresses will not be published, but may be obtained from our Bureau of Information by request, mentioning the title of the article and date of publication.—Editor.

BUSINESS TO RECEIVE NEW AID FROM GOVERNMENT CHEMISTS

Engineering assistance of a new order is now offered to American business by the U. S. Bureau of Chemistry, which has inaugurated the important service of translating scientific discovery into commercial practice. Reports on raw materials, the cost and method of installing new processes, and the market for new products and by-products, are among the functions of the office, which acts as a consulting engineer for manufacturers and investors. All processes and discoveries originated in the bureau will be developed beyond the laboratory stage, to a point where costs and profits can be discussed with the interested investor. A government scientist, noted for his work in reducing grain-dust explosions, with their enormous loss, directs the work of the new "Office of Development Work."

PRIZES FOR DESIGNS OF PLANES TO LIFT HEAVY LOADS

Airplane designers who have plans for machines capable of lifting and carrying exceptionally heavy loads now have an opportunity to compete for $5,000 in prizes. The contest is to be conducted by the Aerial League of America, 280 Madison Ave., New York, and calls for designs of planes able to lift 20, 50, 100, 150, and 200 tons of cargo. The competition is expected to bring out many new ideas in weight-lifting wing design and cargo-carrying fuselages, and to have a large educational value. Enterprising shipping interests already have intimated their readiness to undertake aerial shipment as soon as adequate and efficient machines are demonstrated.

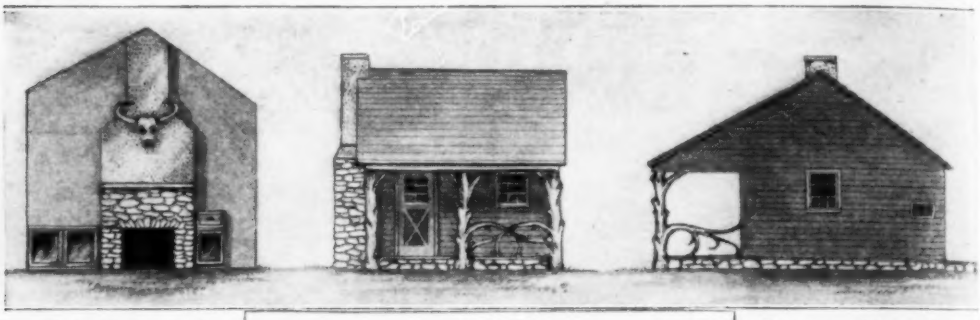
STORY OF PETROLEUM INDUSTRY TOLD IN FOUR-REEL MOVIE

Some industries are made interesting only by clever publicity effort, but the romance of petroleum is unquestioned. That precious fluid mineral appeals to the normal imagination more vividly than even gold itself. And now the U. S. Bureau of Mines, aided by a large oil concern, has produced the whole story of petroleum in four full reels of motion pictures. Prospecting, production, refining, distribution, and ultimate use, each with its own absorbing tale of adventure and promise of fortune, are dramatized in the new movie, which is designed to interest the layman as well as the student engineer. Those who have a real educational use for the films may borrow them from the bureau.

TO TEACH EXECUTIVE MANAGEMENT IN HUNDREDS OF COLLEGES

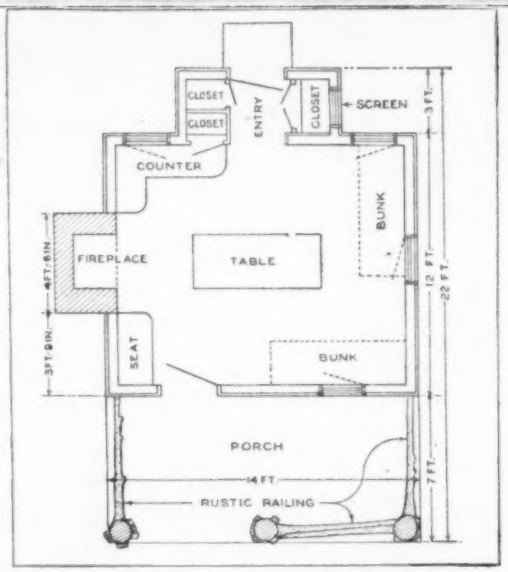
Courses that will train their students for the executive management of industrial undertakings are to be established in more than half of the 620 colleges in the United States. This remarkable project, conceived during a recent educational convention, has the support of corporations with a total capital of $26,000,000,000, including public utilities and mining interests as well as manufacturers of all varieties. Not only will practical courses be given, but students will be aided in selecting a career, summer work of a kind calculated to supplement the study will be offered, and extension courses will be arranged for those already occupying responsible positions. An appropriation of $100,000 a year has been made to finance this new educational work.

SIMPLE CAMP LODGE FOR ALL-SEASON USE



The End Wall of the Room, with Its Field-Stone Fireplace, and Seats with Cupboards Beneath

Front and Side Views of the Finished Cabin, Showing the Rustic Porch, the Stone Chimney, and the Foundation Wall



Floor Plan of the Lodge, Indicating the Wall Seats, Folding Bunks in the Corners, and Built-In Table in the Center

HUNTING and fishing lodges, or vacation cabins, when designed to carry out the rustic effect that best harmonizes with their woods environment, frequently disappoint their builders by costing more than the conventional form. The main reason for this is that the enthusiastic designer generally carries his elaboration of rusticity too far, introducing a labor charge that outweighs the saving made by using native crude materials. The simple camp lodge described here economically secures the desired primitive effect by confining the rough construction to the salient details of foundation, outside chimney, and porch, the house itself being of the plainest type.

The entire structure covers a ground space 22 by 14 ft., of which the front porch occupies 14 by 7 ft., with the house roof extended over it. At the back a 3-ft. projection incloses the rear entrance and three closets, one of which has a window that can be double-screened, and may be used as a pantry. The remainder of the space is taken up by a single room, 14 by 12 ft. Practically all the really necessary furniture is built into this room. A table, about 2½ by 6 ft., occupies the center, with storage compartments underneath it. In two of the corners are bunks that fold up against the wall, and the other two corners are fitted with wall seats that have cupboards and drawers beneath.

The foundation beams rest upon footings of field stone, set 18 in. into the ground, and the foundation wall is of the same material. So is the lower part of the outside chimney, which for a height of 8 ft., is 4½ ft. wide, the smaller part above being of cement, stucco-finished. The chimney flue is 8 by 8 in., accommodating a fireplace, 2½ ft. wide and 2 ft. high, with a cement hearth 3 in. thick. Another interesting detail is the three porch pillars, made of untrimmed tree trunks with the bark on, the bent branches of which are arranged to form the porch railing. The floor is yellow pine, and the trim and interior fittings white pine.

The cost of such a lodge will vary enormously with local conditions and facilities, but in most cases the owner will be able to do enough of the work himself greatly to reduce the labor charge, as no high order of skill is demanded.

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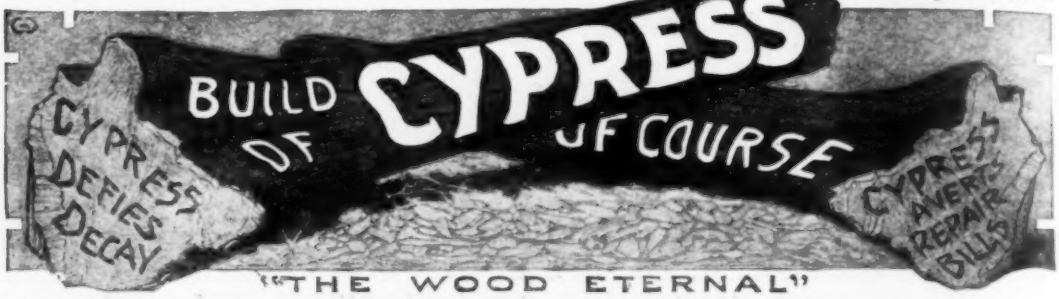

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Vol. 34

Contents for December, 1920

No. 6

Accident—Trolley Car Struck by Locomotive..... 848
Aeronautics—Air Lock, Experimental, Seven and a Half Miles High in..... 841
Aeroplane, Automobile Towed through Streets by.. 876
Aeroplane, Cargo, New Type Wing on, by Paul H. Woodruff 802
Aeroplane, One Man Sporting, Conveniences of.... 871
Aeroplanes, Heavy Lifting, Prizes for Designs of... 959
Air Craft Landing Station on New York Hotels.... 912
Air Craft, Lloyd's Register to List..... 884
Air Fleet, West Coast, Established..... 844
Air Race, Gordon Bennett, France Wins Cup..... 821
Alloy Resembling Gold, Corrosion Resisted by..... 903
Animals, Predatory, Hunters Rid Texas of..... 906
Apple Grader, New Type of..... 811
Apprentices, Shop, Employer Establishes Home for. 859
Automobile Body, Light Plywood..... 910
Automobile Bumper, Vertical, Damage Reduced by. 880
Automobile, Combined Fuel Gauge, Lock, and Valve. 918
Automobile Costs, Device for Auditing on Car..... 896
Automobile Lights, Time Switch Turns On..... 884
Automobile, Running Gear without Frame for..... 820
Automobile Signals Show Warning Front and Rear. 829
Automobile, Simple Winter Equipment for..... 824
Automobile, Tiny Electric, for Children and Invalids 814
Baby Cab Built as Sidecar for Bicycle..... 889
Balsa—The Lightest Useful Wood, by Harry A. Mount 815
Baseball, Parlor, Has All Regular Plays..... 844
Bath Truck for Circuses and Military Bodies..... 879
Battleships, Giant, Keels Laid for..... 895
Bicycle, Toy, Insures Traction..... 844
Birds, Pet, Whistling Air Tank Teaches to Sing... 855
Blasting, European Mines Use Odd System of..... 919
Blower, Little, Used as Machinery Crevice Cleaner. 838
Boll Weevils Burned in City Street..... 846
Book Holder Attachable to Chair or Desk..... 911
Boots, All Sizes, Shoe Dealers Have..... 907
Box Tool, Screw Machine, Is Economical..... 917
Brake, Hydraulic, Tailrace Damage Prevented by... 881
Bridges, Concrete, Floods Submerge in Asia..... 919
Bridges, Railway, Concrete Brine Troughs Protect.. 812
Bungalow, Domed Roof, Resembles Observatory... 892
Bust of Washington, Argentina's Snow Makes..... 894
Cadmium Substitute for Zinc in Galvanizing..... 904
Camera, Tape Line Supplanted by..... 818
Camp Lodge, Simple, for All Season Use..... 960
Chemists, Government, Business to Receive New Aid from 959
Children's Pages 920
Church, Iowa, Pastor and Communicants Rebuild.. 907
Church on Wheels, Fantastic, Bolsheviki Abandon 910
Civic Features 908
Clamps, Safety Grounding, Electricians Protected by 922
Clock, Astronomical, Has Luminous Sun and Moon. 843
Clocks, Phonographic Messages Delivered by..... 867
Compass, Aeronautical Selenium, for Tail of Plane.. 840
Concrete Surfacing Machine 877
Conveyor, Homemade, Hastens Shoveling Job..... 893
Cotton Waste, High Grade Paper Made of..... 802
Countersinking Machine, Horizontal Double Spindle 863
Cows, Exhibition Device Shows Milk Yield of..... 900
Crane, Movable, for Garage..... 860
Crucible Pouring Device for Foundry Work.. 922
Dam, Masonry, India's Crops to be Saved by..... 804
Deer, Ladders Help Out of Power Flume..... 872
Dentistry, Improved Motor for 822
Dirigible, Italian, Purchase by United States Reported 837
Dirigibles, Naval, Huge Sheds Built for..... 858
Disk Grinder, New Double Spindle..... 848
Docks, Floating, Floods of Oriental Rivers Overcome by 837
Dog Teams, Supplies Hauled over Yukon by..... 905
Drill, High Speed Twist, Demonstration of..... 812
Drills, Lost Oil Well, Tool Recovers..... 916
Drink Mixer, Double, Has Single Motor..... 900
Drum, Collapsible, Packs in Small Space..... 858
Eels, Spawning, Sea Searched to Solve Puzzle of... 878
Egg Producer, Champion, "Babe Ruth" Is..... 830
Electric Bulb, Double Filaments Lengthen Life of.. 916
Electric Fan, Heating Unit on..... 838
Electric Light Globe, White, Shows Red at Night.. 842
Electrical Devices, Houseboat to Tour China with.. 854
Electrical Tests, Combination Instrument Makes... 855
Elevator Tower, 260-Foot, Pulled to Ground..... 888
Enamel, Softening Point Experimentally Studied... 872
Executive Management, Colleges to Teach..... 959
Explosion on Oil Tanker Fatal..... 840
Fatigue, Factors in 892
Fence, Iron Ore, Farmer Builds..... 910
Ferryboat, Walking Beam Breaks, Wrecking..... 823
Fire Engines, Fuel from Tank Truck for..... 854
Fire Signals, Drillmaster Uses Electric Horn for... 903
Firebox, Single Plate Forms Crown and Sides of... 878
Fires, Forest, Pump for Fighting..... 882
Fish, Electrically Dried, Keeps Fresh..... 862
Fish, Revolving Screen Keeps from Irrigating Ditches 898
Flag, Peary's North Pole, Traveling South..... 830
Flasher, Diminutive, for Christmas Trees..... 854
Flytrap, Odd, Flies Brushed from Cows with.....913
Forests, Autumn, Aeroplane Maps..... 900
Fuel, Draft Deflector on Furnace Grate Saves..... 918
Fuel, New, Obtained from Waste Lye..... 872
Funnel, Flat, for Gasoline..... 860
Furnace and Blowtorch Combined..... 870
Gallstones, Cattle, High Prices for..... 858
Games, Olympic, Pictures Sent by Wire to Paris... 825
Gasoline Filter, Visible, for Autos..... 830
Gauge, Hydraulic Pressure Records Water Volume.. 907
Geography—Figures on United States Compiled from Survey 873
Health, Town Cultivates, by Robert H. Moulton.... 885
Heating Pad Applied like Belt..... 838
Highway, Concrete, Rebuilt Half at a Time..... 890
Highway Signs, Arrows on, Traffic Guided by..... 917
Hoisting Machine Alines Lamp-Posts..... 878
Household Devices 914
Hydroelectric Development, Japan's, High Voltage.. 871
Hydroelectric Power Plant, Huge, Opening of..... 839
Hygrometer Records Presence of Person in Room... 860
Incinerator, Safety, Made of Concrete Blocks..... 896
Laboratory Electric Motor for Stirring Fluids..... 919

[Continued on Page 4]

[Contents—Continued]

Lake, Lava Bottomed, Water Supply Insured by Damming, by Horace E. Thomas 849
Lake, Western, Springs Leak after Earth Disturbance 824
Lamp Banks, Resister Units Eliminate 904
Lamp Shade, New All Metal, Prevents Eye Strain 823
Landmark, Old, Mormon Sentiment Preserves 884
Laundry, Community Farm, Creamery Has 876
Lever Jack, Modified, for Motorists 871
Lights, Window, Colored Gelatin Slides for 814
Limousine Luxuriously Fitted for Touring, by John Anson Ford 868
Lobster, 28 Pound, Mounted in State 866
Lock Washer, Bolt Nut, Used with Wooden Parts 918
Lumbering, New Method of Reduces Accidents 818
Magnetometer, Magnets Tested by 893
Magnifying Instrument Dial Reduces Eye Strain 904
Micrometer, Direct Reading 919
Mine Rescue Teams Compete in Big Tourney 889
Model, Life Size, Architect Builds 872
Monoplane, Commercial, Quick Dismantling of 863
Motorcycle Carries Canoe on Sidecar Frame 895
Motorcycle, Incased, Makes Attractive Vehicle 854
Motors, Small, Air Governor for 883
Moving Pictures, Motor Car Parts, of Paper Cut-Outs 843
Newspapers, Slot Machine Sells 858
Nozzle, High Pressure, One Man Controls 824
Nursery, Beach, Bathers' Babies Cared For in 862
Oil Field, Richest, Pasture becomes 866
Ornithropter Makes Flier Real Birdman 846
Ovens, Huge, Millions of Biscuits Made by 858
Oxygen Absorption Capacity Versus Lung Capacity. 847
Oyster Hatchery, Centrifugal Force Used by 826
Pearls Made from Fish Scales New Industry 906
Peat Excavator, 700 Tons per Day Dug by 812
Penitentiary, Model, State of Illinois Has 855
Petroleum Industry, Four Reel Movie Tells 959
Phonograph Needles, Used, Machine Repoints 917
Phonograph "Silencer," Sound Volume Varied by 918
Photograph Taken in Summit House of Pikes Peak 894
Photography, Highly Sensitive Photoelectric Compound for 911
Pillar of Granite, Swinging, Hunters Discover 873
Pinion, Teeth of Odd Contour on 823
Pipe Line, Ocean, Oil Delivered to Ships with 880
Pistol, Gas, No Permanent Harm from 879
Pistons, Tool for Inserting into Cylinders 911
Porcelain, New, Has Properties of Glass 917
Prison Clearing House, Sing Sing May Become 842
Propeller, Hydraulic, Jet Principle Used on 852
Pruner, Tree, Adjustable Frame Holds Saw Blade 916
Pump and Turbine Unit for American Refiner 899
Pump, Super-Vacuum, Internally Oil Sealed 830
Pump, Vacuum, Works like Injector 845
Radiotelephone, Portable, Compact and Simple 894
Railroad, Double Gauge, Australia Plans 814
Railroad, Freight Car Barges Used by 873
Railways, Holland and Belgium to Electrify 922
Relics of "Mayflower" Found in English Hostelry. 862
Repair Shop, Traveling, for Autos and Tractors 902
Rifle, Army, New Trigger Reverses Usual Operation 822
Rifle Range, New, "Squarehead" Attack Repelled on 911
River, Mississippi, Seeks New Outlet, by H. H. Dunn 831
Road, Auto, on Railroad Snowsheds 805
Road Building, Dangerous, in Western Mountains 959
Road, 50 Mile, Volunteers Build across Desert 859
Roadway Crosses Top of Dam 864
Robbers, Telephone Coin Box, Alarm Catches 896
Sand Unloader, Suspended Bucket Conveyor Is 877
Santa Claus, Colossal, Built by Department Store 899
Scrap, Shop, Conversion Process for Salvaging 810
Sealing, Arctic, Off Temperate Shores, by Lawrence William Pedrose 890
Seaplanes, Assembling at Naval Station, by Frank B. Howe 896
Sheet Asphalt Mines Supply Pavements, by James C. Kelly 874
Shingles, Brick, Substitute for Ordinary Type 898
Ship, Concrete, Unusually Thin Walls in 866
Ship, Small Tank, to Carry Oil in Alaska 824
Ship, Submerged Cable Helps "Blind" Pilot to Steer 818
Shoes, X-Ray Machine Helps Fit Correctly 842
Shooting Match, First Aerial 892
Shutters, Device Opens and Closes from Inside 919
Signal Fires on Desert, by J. Cecil Alter 913
Signaling, Light, Rules for Speed of 918
Signboard, Village's Alibi for Bad Road 882
Slide Rule, Oil Flow in Pipes Computed by 913
Smoke Dive Amusement Park Feature 847
Snowplows, Tractor, for New York 845
Spark Plug, Combustion Chamber Blows Carbon from 922
Sport, Aquatic, Race for Free Lunch 888
Stadium, Odd Hydraulic System Used to Build 870
Stage "Props," German Substitutes for 860
Stagecoach, Old, Becomes Refreshment Stand 894
Stamps, Automatic Presses Print 853
Stations, Waiting, Solar Heat Used for 868
Stills, Hidden, Fliers Discover 900
Stoves, Concrete Heating, Fuel Saved by 899
Subway, New York, Needs for Future 903
Sucker, When It Becomes a Mullet, by Sam E. Conner 901
Swimming Pool, Unusual Design of 863
Tanks, Big, Roll and Float 25 Miles 861
Telephone, Loud Speaking, Unique Test of 910
Telephone, Violin Music Carried to Patient by 846
Telescope, Tourists Saved Climb of Mt. Whitney by 8[illegible]
Tent Cottages, Thatched Palm Houses Replace 867
Theater Seats, Pocket for Wraps Under 817
Therapy, Radiant, New Cabinet for 822
Timber Destruction by Ants, Japan Prevents 898
Tire Chain Coupling Link Repairs and Tightens 922
Tire Tool, Casings Spread without Obstruction by 841
Town of Pennsylvania Renamed Quentin 804
Tractor, Rigid Four Wheel, Novel Action of 801
Transport, "America," Globe Circled by 906
Tree, California, Horsemen Sheltered in 905
Tree Felling Machine Bears Saw on End of Piston Rod 892
Tricar, Passengers Carried in Front by 825
Truck, Hobo, Expenses Earned by 895
Truck, Motor, Converted into Railroad Car ..... 84[illegible]
Trucks, Huge, Carry Auto Bodies 828
Trucks, Side Door, Cars Loaded Directly from ..... 9[illegible]
Vermin, Hydrocyanic Gas Warfare on 866
Vibration Recorder, Light Beam Tracings Made by 819
Village, Arapahoe, Built in Circles, by Fletcher Steele 806
Water, Storage, Ice Dam Formation to Hold 821
Water Vibration System, Mines Use for Power 916
Weather Recorder, Lightest, for Rocket Exploration, by S. R. Winters 827
Windshield Cleaner, Electrically Heated 904
Wire Ties and Tying Tool for Reinforcing Bars 916
Wireless News Bulletins Latest Newspaper Feat 872
Wireless System Installed on Sidecar 810
Wireless Waves Bent by Coast Lines 884
X-Ray of Hand Newest Record of Criminals 871

SHOP NOTES

Anvil, Special Garage 937
Apron, Workshop, Spring Holds 942
Ash Sifter Mounted on Homemade Wheelbarrow 926
Barrel, Device for Rolling 931
Bench Dog, Simple and Effective 928
Bolts, Preventing from Turning 924
Boring Tool, Long, Holder for 942
Brass, Coloring for Laying Out 941
Cattle Feeder for Winter Use 930
Cement Blocks Imitated in Form Work 932
Chassis Frames, Bent, Method of Straightening 932
Circuit Breaker for Electric Motor 921
Clamp Aids in Tapping Drilled Holes 927
Conduit, Making Right Angle Bends in 938
Counterweights, Hollow Columns Conceal 942
Decimal Equivalent Tables, Device Helps Reading of 929
Dictating Machine Records Made from Old Records 940
Drill Press, Boring Holes in 931
Drill Press Feed Rack, Repairing 928
Engine Cooling, Hose Clamp Limits 928
Faceplate for Multiple Thread Cutting 927
Feed Nut, Worn, Readjusting 940
Forge, Gas Fired 937
Garage Door, Passage of Car Closes 935
Glazier's Points Held Tight While Driving 941
Grease Leaks, Spring Washer Cures 938
Hawser, Steel, Unwinding Outer Strands of 932
Hoofs, Muffled, for Horses' Safety 936
Ice Hauling, Snow Track for 934
Indicator, Water Level, for Concealed Tank 926
Inner Tubes, Cap for Deflating 929
Kerosene as Antifreeze Solution 931
Lamp Shade, Electric, Adjustable 933
Lamp, Trouble, for Automobile 924
Lathe, Tool Grinder Attached to 940
Level, Water, Cheap and Accurate 941
Lumber Handlers, Hooks Aid 934
Lumber Shed, Shelter Built on 929
Mica Commutator Strips, Undercutting 927

[Contents Continued on Page 6]

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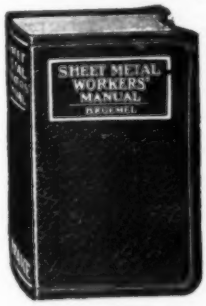

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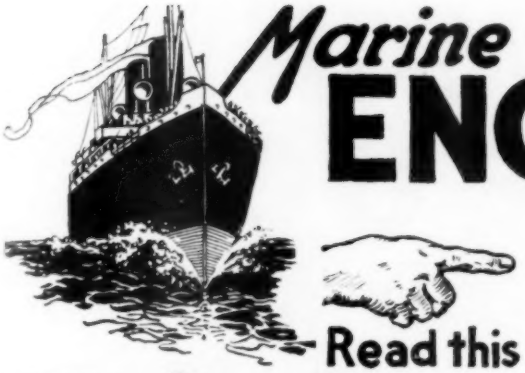
(Contents—Continued from Page 4)

Multiplication and Division, Rapid, Device for..... 935
Oil, Fuel, Keeping Liquid in Cold Weather..... 938
Pins, Wire, Snaper Used to Cut..... 936
Pipe Joint, Emergency..... 936
Planer, Machining Profiles on..... 923
Plowing, Chain Attachment Helps..... 929
Rack, Stock, Easily Moved..... 941
Rack, Stockroom Display, Novel..... 930
Radiator Heater, Electric Lamp, for Automobile.... 927
Rawhide Pins, Fixture for Swaging..... 934
Rod Bearings, Connecting, Clamp Holds in Vise... 935
Rubber, Removing Yellow Stain from..... 928
Sandpaper, Holder Economizes Use of..... 933
Scale, Deadbeat, Postal Scale Converted into..... 941
Shaft Repair, Temporary..... 933
Shingles, Kink for Laying..... 939
Ship, Wooden Patch for Jagged Hole in Bottom of. 939
Sled, Breaking Out from Ice..... 937
Snow Houses, Wire Fence Frame for..... 924
Snowshoes, Homemade 924
Soldering Iron Switch, Automatic..... 936
Stovepipe Radiator, Coal Saved by..... 928
Tank, Concrete, Air Chamber Prevents Bursting of. 926
Tapers, Two, Turned at One Setting..... 934
Tiling, White, Making Imitation..... 927
Tire Pump Assembly Fixture..... 942
Tree Support, Neat and Strong..... 929
Trees, Fruit, Protected from Cold..... 935
Triangle, Convenient, for Draftsmen..... 935
V-Block, Adjustable 933
Wrench, Socket, Safety Setscrew Used as..... 933
Wrench, Tap and Reamer, Improved..... 938

AMATEUR MECHANICS

Ash Sifter, Automatic..... 954
Blueprints Made from Pencil Sketches..... 945
Book Rests, Homemade..... 956
Brazing Apparatus for Home..... 944
Brush, Waxing, Floors Finished with..... 946
Brazing Apparatus for Home 944
Brush, Waxing, Floors Finished with..... 946
Buttons, Uniform, Repairing..... 955
Carpet Beater Made from Old Hose..... 944
Checkerboard and Checkers 956
Clock, Phonograph Alarm 947
Fishing, Ice, Alarm for Night..... 956
Fishing, Winter, Tip-Up for..... 952
Floor Polisher, Homemade..... 957
Footrest, Easily Made..... 957
Gocart, Doubling Capacity of..... 945
Gold Lacquer for Metals..... 950
Hinges, Double Acting Spring, Making..... 951
Hockey Rink, Arrangement of 954
Hose Supports Hold When Not in Use..... 946
Lamp, Reading, Glare Shield for..... 943
Lawn Mower, Hand Power Device Made from..... 952
Leaf Impressions in Natural Colors..... 957
Matches, Carrying in Gun Stock..... 950
Motor Made from Electric Bell..... 953
Motor, Steel Ball, Dry Cells Operate..... 946
Motorboat Engines, Rope Starter for..... 945
Music, Pumpkin Stalks Furnish..... 958
Nicotine Spraying Solution..... 958
Painting, Hardware Protected During..... 955
Photography—Holder for Developing Cut Films.... 952
Photography—Switch for Producing Dissolving Views 947
Potato Ricer, Tin Can Makes..... 945
Poultry House Doors, Hanging..... 953
Pump, Force, Automobile Operated..... 951
Radio Panel with Navy Type Loose Coupler..... 948
Rheostats, Water, in Series..... 951
Rocker, Wedges Prevent Tipping of..... 947
Roofing, Prepared, Laying like Shingles..... 944
Rubbers, Keeping On in Muddy Roads..... 951
Shot Cartridges for Big Game..... 946
Steps, Attic, Folding..... 953
Stovepipe, Old Cans Prolong Life of..... 957
Swing, Porch, Rocking Horse Made into..... 945
Tank, Bowl Siphon for Draining..... 958
Toy Donkey Nods and Wags Its Tail..... 955
Toy, Simple Aerial 957
Toys, Jumping, Made from Magazine Pictures..... 958
Trick—Water Transformed into Wine and Ink.... 954
Trousers Press, Homemade..... 947
Valve, Needle, Built in Pipe Tee..... 956
Vinegar Made without Fruits..... 944
Wagon Seat Made of Barrel Staves..... 955
Wallpaper, Sewing Machine Perforates..... 956
Water Heater, Exhaust..... 943
Wing Nut and Screws, Homemade..... 951



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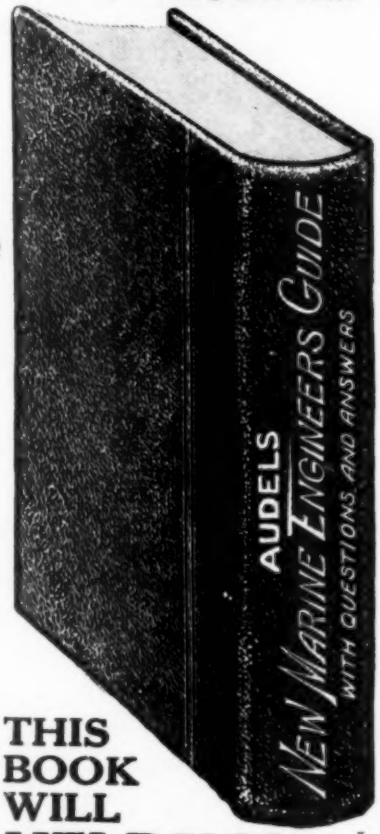

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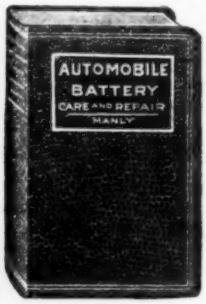

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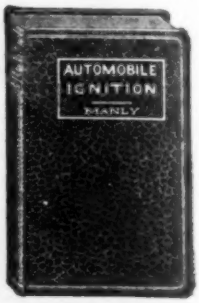

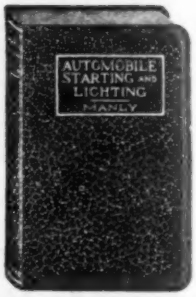

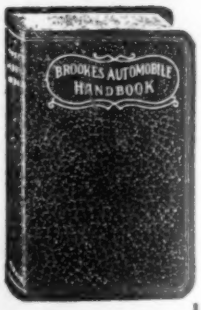

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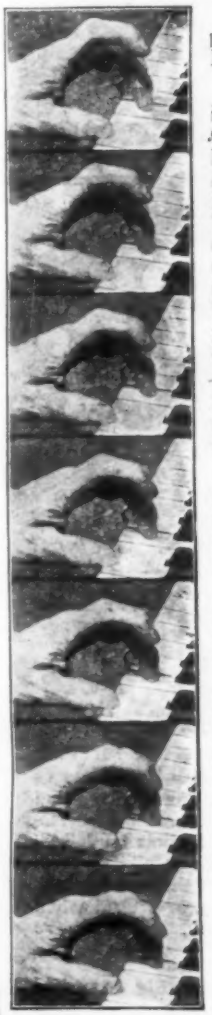

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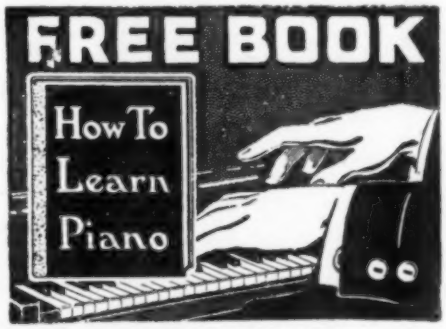

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Now, follow me carefully. I'm going to tell you exactly how to do it. I'm the possessor of a "secret" for which men have been searching since Time began.

There's no need to discuss the whys and the wherefores of this "secret." Suffice it to say that *It Works*. That's all we care about—*It Works*. Over 400,000 men and women the world over have proved it for themselves. Among them are such men as Judge Ben B. Lindsay; Supreme Court Justice Parker; Governor McKelvie of Nebraska; Wu Ting Fang, ex-U. S. Chinese Ambassador; Governor Ferris of Michigan, and thousands of others of equal prominence.

Some of the things this "secret" has done for people are astounding. I would hardly believe them if I hadn't seen them with my own eyes. Adding ten, twenty, thirty or forty dollars a week to a man's income is a mere nothing. That's merely playing at it. Listen to this:

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Then he learned the "secret." In two weeks he was in business for himself. In three months his plant was working night and day to fill orders. During 1916 the profits were $20,000. During 1917 the profits ran close to $40,000. And this genial 64-year-young man is enjoying pleasures and comforts he little dreamed would ever be his.

I could tell you thousands of similar instances. But there's no need to do this as I'm willing to tell you the "secret" itself. Then you can

put it to work and see what it will do for you. I don't claim I can make you rich over night. Maybe I can—maybe I can't. Sometimes I have failures—everyone has. But I do claim that I can help 90 out of every 100 people if they will let me.

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The Will is the motive power of the brain. Without a highly trained, inflexible will a man has about as much chance of attaining success in life as a railway engine has of crossing the continent without steam. The biggest ideas have no value without will-power to "put them over." Yet the will, although heretofore entirely neglected, can be trained into wonderful power like the brain or memory and by the very same method—intelligent exercise and use.

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Develop your will-power and money will flow in on you. Rich opportunities will open up for you. Driving energy you never dreamed you had will manifest itself. You will thrill with a new power—a power that nothing can resist. You'll have an influence over people that you never thought possible. Success—in whatever form you want it—will come as easy as failure came before. And those are only a few of the things the "secret" will do for you. The "secret" is fully explained in the wonderful book "Power of Will."

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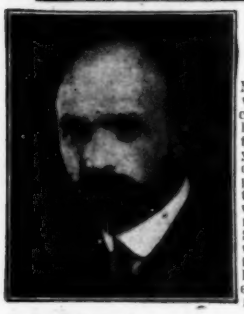

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GET STRONG'S SUPPLY CATALOG NOW

Strong's Supply Catalog lists only such things as have proven satisfactory. We do the "trying-out"—not **you.** Because we buy in large quantities we are able to demand best quality at lowest possible prices. For nearly twenty years we have been passing this advantage on to our customers until today Blue Handle Brand brushes and supplies are in favor the world over.

Write today for your copy of Strong's Supply Catalog
DETROIT SCHOOL OF LETTERING
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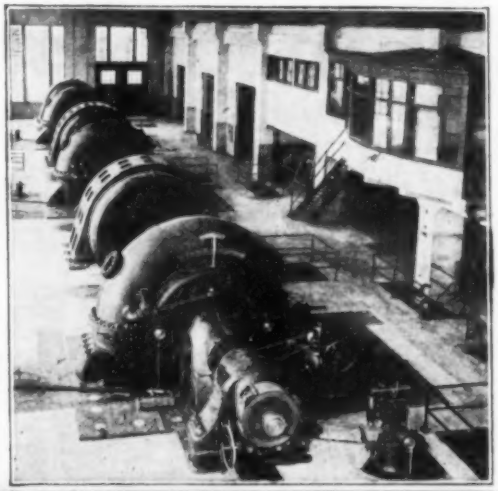
QUICK SUCCESS *at home – under an* ELECTRICAL ENGINEER

I am a Graduate Electrical Engineer. I have the legal right to sign *E. E.* after my name. *E. E.* means Degree of Electrical Engineer and is awarded by Universities and Schools of Science only after years of study and research.

My practical experience is extensive. I was formerly with the General Electric Co.; former General Manager of company manufacturing Jenney Electric Motors; also formerly with Fairbanks, Morse & Co.; and now President and Director of the Wicks Electrical Institute.

Albert Wood Wicks. E.E.



Be a GRADUATE Electrician

Wicks Men Fill High Paying Positions

Graduate Electricians are needed by the thousands—at once. Look through any electrical magazine and see the opportunities for ambitious men with thorough training. That is the big thing—thorough training. That is the reason Wicks men are getting big pay to START—they are trained right. The big men in the electrical field know my reputation as an Electrical Engineer. They know that my thorough, practical, scientific course will fit men to hold the best kind of positions in this great industry. They know that Wicks men are *good* men.

Foremost and Leading School

Wicks Electrical Institute is known nationally and is highly endorsed by the largest electrical concerns in the country. It has always been recognized as the largest and foremost home training school in electricity.

New Copyrighted Method Brings Quick Results

I guarantee to make you a graduate electrician quickly—or your money back. My method is a new step in quick training for big jobs. It is very easy, thorough and full of interest. You need only a common school education.

Spare Time—Earn While You Learn

My method requires only a part of your spare time. It will not interfere with the job you are now holding. Don't worry about cost; it is low—the terms are easy. What is more I teach you to earn as you learn. Most of my students make several times the cost of the course by the time they finish.

Splendid Opportunities All Over the World

The whole world regards America as the great leader in the Electrical Field. Foreign lands come to us for trained men. This offers unlimited opportunities to Wicks Graduate Electricians. These positions pay big salaries and give you the chance to see distant lands.

Qualify to Fill One of These Big Paying Positions

Chief Electrician
$300 per month and up
Sub-Station Operator
$200 per month and up
Electrical Contractor
Unlimited
Maintenance Electrician
$250 per month and up
Power Plant Supt.
$200 to $1000 per month
Electrical Wireman
$150 to $200 per month
Meter Tester
$150 to $200 per month
Electrical Sales Engineer
Unlimited
Supt. Elec. Installation
$250 to $500 per month
Traveling Elec. Inspector
$200 per month and up

Splendid Electrical Outfit and Tools Free

As an aid to rapid progress I will give you a very complete and valuable set of electrical instruments and equipment absolutely FREE. *With them you can make money long before completing the course.*

Wicks Life Employment Service

Wicks men do not have to worry about jobs. As a rule by the time the student has finished I have the special kind of a position he wants waiting for him. That is not all; I offer my students the free use of my employment service for life. My motto is "Big Jobs for Wicks Men" and I do all I can to secure the best positions for them.

Coupon Gets Big FREE Book—NOW

If you return the coupon *at once* I will send you prepaid and absolutely free my splendid new book, "Opportunities in the Electrical Field." It is interesting and instructive. It will show you many things you never knew about Electricity. Due to the paper shortage I could get only a limited supply of these books. Send the coupon before they are all gone.

I will also send full information about my copyrighted home study course—also what Wicks students are doing everywhere. That is not all—at the present time I am making a special offer to ambitious men. I will tell you about this in a letter if you act at once.

Mail this coupon now—get in under the wire.

Albert Wood Wicks. E.E.

President and Director, Wicks Electrical Institute,
Dept 1199, 431 S. Dearborn Street, Chicago.

Mail This Coupon—TODAY

A. W. Wicks, President, Wicks Electrical Institute,
431 S. Dearborn St., Dept. 1199, Chicago.

Without obligation to me, send at once full information of your special offer, your course in Electricity; what your students are doing and your splendid big book Free.

Name .....

Address .....

City ..... State .....

CARTOONISTS MAKE BIG MONEY

Every time Sid Smith makes a stroke of his pen, millions of people laugh and every laugh means money for the man who creates it. Andy and Min earn big money for him every day.

In this weary old world, everyone from childhood to old age wants to be made to laugh, and men who succeed at this are highly paid for it. By capitalizing their humorous ideas and drafting ability, cartoonists like Briggs, Fox, King, and Smith make $10,000 to $100,000 a year. YOU may have ideas that are equally good. Let Federal training give you the skill to put them on paper.

Send For This Book

If you like to draw, all you need is training to bring out your originality of style and ideas. "A Road to Bigger Things" tells how you can capitalize your liking for drawing through the Federal Course in Applied Cartooning. It offers you the opportunity to study cartooning under 32 of America's masters, including Clare Briggs, Sid Smith, Fontaine Fox, and others. It is like learning under these big men themselves and getting the composite knowledge of their years of experience for your personal use.

What your present position may be doesn't matter; if you have this liking for drawing, Federal training will develop it and fit you for a pleasant and highly profitable profession. What Federal training has already done for thousands of others, it can do for you.

Send the coupon below, with six cents to cover postage, and we will mail your copy of "A Road to Bigger Things." Be sure to state your age and occupation!

Federal School of Applied Cartooning

0203 Warner Bldg. **Minneapolis, Minn.**

- TEAR OUT AND MAIL -

Federal School of Applied Cartooning,
0203 Warner Building, Minneapolis, Minnesota.

Please send by return mail my copy of "A Road to Bigger Things" together with complete information about the Federal School of Applied Cartooning. I enclose 6c postage.

Name _____ Age _____ Occupation _____

Address _____ City and State _____

(Not good unless completely filled out)

Please Mention Popular Mechanics

Be a Master of Traffic Management

There is a big and ever-increasing demand for men trained in Railway and Industrial Traffic Work. The salaries offered range from $50 to $100 a week and up. Hundreds of ambitious men have trained themselves successfully at home by mail under the guidance of LaSalle experts.

Every big business organization must have its traffic expert, its interstate commerce director—and yet not enough really competent men are available. In many places, "second-raters" are trying to direct the shipping while their employers are looking, inquiring, advertising for efficient men able to handle the complicated traffic problems which come up many times every day. This is your opportunity to get into an uncrowded profession — to make quick advancement—to step into a specialized calling—to be the man always needed and to earn a salary which many men do not reach after years of patient, plodding service.

Train by Mail

The LaSalle traffic experts will give you a thoro, specialized knowledge of the methods used by great shippers, railroad and steamship lines; instruct you in rates, classifications, routing, bills of lading, claims, demurrage, railroad accounting, organization, management, interstate commerce laws, etc. Every phase of the subject under the direction of a specialist. You get in months what years of experience alone would not bring, because you profit by the combined experience of many men acknowledged as traffic authorities. Every point made clear. The whole ground thoroly covered. You are prepared to act as a traffic manager because you have a grasp of the entire subject—ready to direct all phases of traffic work.

You need not leave your present position. LaSalle training is given by mail. You can become a traffic expert in your spare hours by the LaSalle method—thoroly prepared to hold a high salaried industrial or railway traffic position. You can pay for your training on our easy terms —a little each month if you wish.

Salaries Raised

Mr. Fred Hoffman took LaSalle training in traffic and reports 500 per cent profit on the cost of his course. Harold Watson got 400 per cent salary increase. B. S. McMullen rose from freight checker to General Manager. Reports like these come to us daily.

Already over 200,000 ambitious men have profited by LaSalle training. More than 35,000 enroll annually in our various courses, getting the benefits offered by an organization of 950 people including 450 business experts, instructors, text writers and assistants. Thousands of LaSalle men are employed in the offices of great corporations like the Pennsylvania R. R., Armour & Co., Standard Oil Co., U. S. Steel Corp., etc. Not only men seeking advancement but many prominent executives have found in these courses the way to larger success.

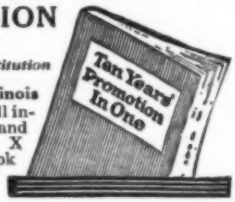
Send the Coupon

Get information about the profession of Traffic Management. The coupon or a letter will bring this—also catalog and all details about LaSalle training—and our famous book, "Ten Years' Promotion in One," the book which has been an inspiration to thousands of ambitious men.

LASALLE EXTENSION UNIVERSITY

"The Largest Business Training Institution in the World"

Dept. 1264-TR, Chicago, Illinois



Please send me catalog and full information regarding the course and service I have marked with an X below. Also a copy of your book "Ten Years' Promotion in One," all without obligation to me.

☐ **Traffic Management — Foreign and Domestic:** Training for positions as Railroad and Industrial Traffic Managers, etc.

Other Courses in LaSalle Training:

LaSalle is the largest business training institution in the world. It offers training for every important business need. If interested in any of these courses, check here:

- ☐ Higher Accountancy
- ☐ Business Administration
- ☐ Production Efficiency
- ☐ Business Letter Writing
- ☐ Law—Bar, LL.B. Degree
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- ☐ C. P. A. Coaching for Advanced Accountants

Name.....

Present Position.....

Address.....

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Penmanship

extends to the public an opportunity to secure the result of 20 years' service as one of the world's leading penmen, in a masterful series of

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Under His Personal Direction

The Ransomerian System of Penmanship was awarded the first prize for best course of lessons in a contest open to the world. It has been adopted as a standard by boards of education, teachers and penmen throughout the country. Many of the ablest teachers of penmanship in America are products of Ransomerian training. Those who are graduated under Mr. Ransom's direction are eagerly sought and are being placed in the highest positions as instructors in America's leading educational institutions, and as supervisors of penmanship in cities and towns in many parts of the country. His correspondence course was compiled from copies and instructions used in the contest in which he won the championship of the world, and represents the height of perfection in both copies and instruction.

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The ability of Mr. Ransom as a teacher has been proven by results produced for more than 10,000 students. He is a penmanship teacher of the highest magnitude. The natural ability, the untiring energy, the lightning action of brain and muscle, are evident in the almost superhuman skill displayed in the execution of copies for his lessons, and when coupled with his vast experience, his enthusiasm and his confidence, carry such conviction to his students by thousands that they accomplish seemingly impossible results in record breaking time. He is a leader who leads from the first instant—whose very name signals success in penmanship. When you place yourself under the direction of his master hand, you are sounding the knell that pronounces inevitable destruction to that shaky, illegible handwriting.

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Kill the *fear* of stammering. Re-education the key. The widely famed Hatfield Method fully outlined in an accurate, dependable, worth-while book—"HOW TO STOP STAMMERING." It has inspired thousands. Order a copy today.

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Comics, Cartoons, Commercial, Newspaper and Magazine Illustrating, Pastel Crayon Portraits and Fashions. Earn money; become famous. Our simple method quickly develops your talent in spare time. By Mail or Local Classes. Write for terms and list of successful students.

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We have a wonderful new system of teaching note music by mail and to first one in new localities we will give free a $20.00 superb—Violin, Tenor Banjo, Ukulele, Hawaiian Guitar, Banjo, Guitar, Banjo-ukulele, Mandolin, Banjo-mandolin or Cornet absolutely free. A very small charge for lessons only expense. (If you want one trial lesson, send 25c.)

We also teach Piano and Organ. We guarantee to make you a player or no charge. Complete outfit free. Special offer to first pupil in each locality. Write at once, no obligation.

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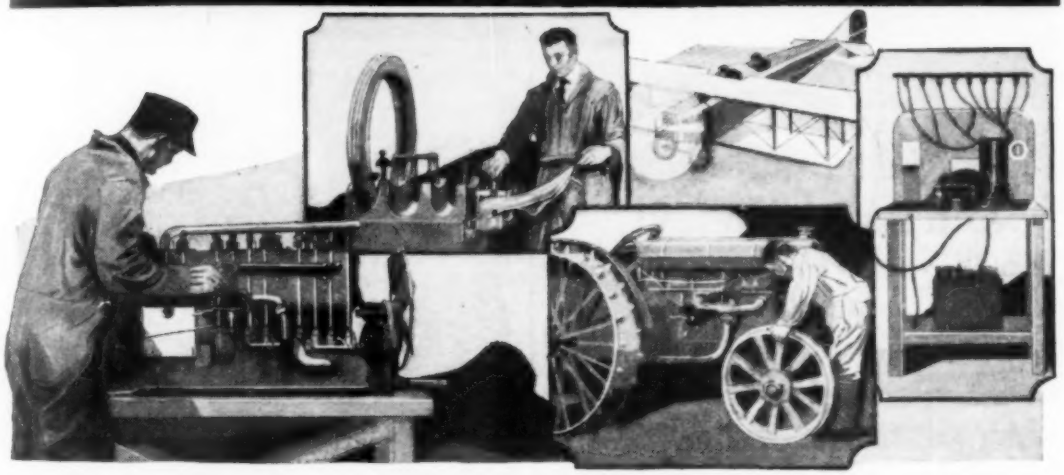
GREER COLLEGE of AUTOMOTIVE ENGINEERING



Where You Get REAL Instruction

No need to tell you of the crying need for auto men who really **know**, or the big money they can make. You know that. The only question is where you can get the best instruction.

BE A "C. A. E." *(Certified Automotive Engineer)*

The prestige enjoyed by Greer graduates is your cue. **A Greer Diploma means something.** Graduate from Greer College of Automotive Engineering **and be recognized as "The Man Who Knows."**

Greer Graduates Get Big Pay

This Is Important:

It is not enough merely to go to some Automobile School for a few weeks. You want to go to the College that makes Master Mechanics, real Certified Automotive Engineers. Here you get thorough instruction in the theory of every phase of automotive engineering, but that is not all; you also get practical training and experience, working right with our expert instructors. We do not claim to be the largest school in the country, but we do aim to give such instruction and training that Greer graduates will continue to be recognized as the **best.**

Our course of instruction and training is thorough and complete. Students who complete the course and earn their Diplomas become **Certified Automotive Engineers.**

Easy to Learn

No school or college education is necessary to complete the course. If you are willing to learn you can easily master it and get started toward real success.

Valuable Book FREE

A new, up-to-date edition of Mr. Erwin Greer's book, **"How to Succeed in the Automobile, Tractor and Airplane Business,"** has just been published. Full of useful information and practical suggestions. Worth $1.00 a copy, yet sent free to anyone interested.

GREER COLLEGE OF AUTOMOTIVE ENGINEERING,
Dept. 12, 1519 Wabash Avenue, Chicago, Ill.

Please send me free your big book as advertised in the December Popular Mechanics. Am interested in subjects before which I mark X.

[ ] **Automobiles** [ ] **Aeroplanes**
[ ] **Tractors** [ ] **Electric Starters**

Name .....
Present Occupation .....
Street or R. F. D. .....
City .....
State .....

GREER COLLEGE of AUTOMOTIVE ENGINEERING

Dept. 12, 1519 Wabash Avenue, CHICAGO

"At Last—a *Real* Job and *Real* Money!"

"And if only I'd started earlier, I could have had them five years ago. I didn't realize at first what spare time study would do for a man. Taking up that I. C. S. course marked the real beginning of my success. In three months I received my first promotion. But I kept right on studying and I've been climbing ever since."

Every mail brings letters from some of the two million students of the International Correspondence Schools telling of advancements and increased salaries won through spare time study. How much longer are *you* going to wait before taking the step that is bound to bring you more money? Isn't it better to start *now* than to wait five years and then realize what the delay has cost you?

One hour after supper each night spent with the I. C. S. in the quiet of your own home will prepare you for the position you want in the work you like best.

Yes, it will! Put it up to us to prove it. Without cost, without obligation, just mark and mail this coupon.

- - - - - - - - - - TEAR OUT HERE - - - - - - - - - -

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5695-B, SCRANTON, PA.

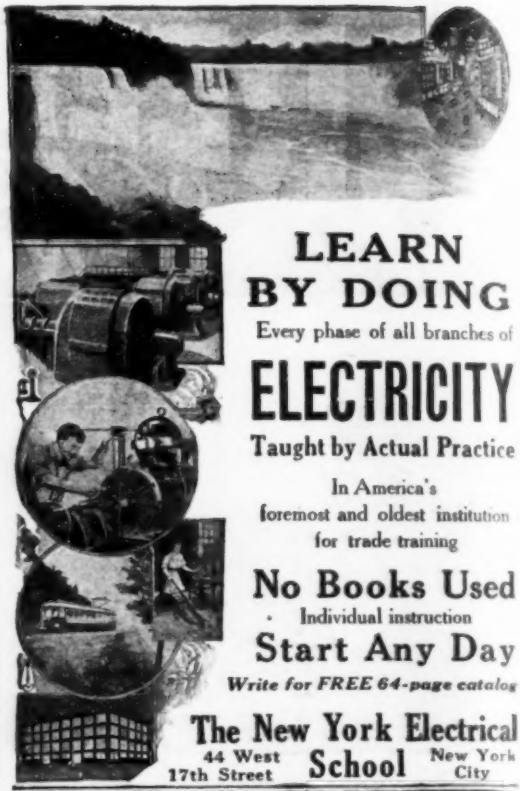
Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
- ☐ Electric Lighting and Railways
- ☐ Electric Wiring
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ MECHANICAL ENGINEER
- ☐ Mechanical Draftsman
- ☐ Machine Shop Practice
- ☐ Toolmaker
- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
- ☐ MINE FOREMAN OR ENGINEER
- ☐ STATIONARY ENGINEER
- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
- ☐ Architectural Draftsman
- ☐ Concrete Builder
- ☐ Structural Engineer
- ☐ PLUMBING AND HEATING
- ☐ Sheet Metal Worker
- ☐ Textile Overseer or Supt.
- ☐ CHEMIST
- ☐ Mathematics
- ☐ SALESMANSHIP
- ☐ ADVERTISING
- ☐ Window Trimmer
- ☐ Show Card Writer
- ☐ Sign Painter
- ☐ Railroad Trainman
- ☐ ILLUSTRATING
- ☐ Cartooning
- ☐ BUSINESS MANAGEMENT
- ☐ Private Secretary
- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
- ☐ TRAFFIC MANAGER
- ☐ Railway Accountant
- ☐ Commercial Law
- ☐ GOOD ENGLISH
- ☐ Teacher
- ☐ Common School Subjects
- ☐ CIVIL SERVICE
- ☐ Railway Mail Clerk
- ☐ AUTOMOBILE OPERATING
- ☐ Auto Repairing
- ☐ Navigation
- ☐ AGRICULTURE
- ☐ Poultry Raising
- ☐ Spanish
- ☐ French
- ☐ Italian

Name_____
Present Occupation_____
Street and No._____
City_____ State_____

Canadians may send this coupon to 7-25-19
International Correspondence Schools, Montreal, Canada

Please Mention Popular Mechanics



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Prepare by mail in spare time for this attractive profession, in which there are great opportunities. Send at once for free book "How to Become a Banker."
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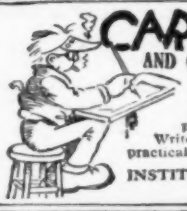
American School of Banking, 19 McLean Bldg., Columbus, O.



CARTOONING

AND COMMERCIAL ILLUSTRATING

This is not a prize offer or a free offer, but a bona fide proposition to teach the essentials of a pleasant and highly profitable art. Write for information on special practical course of fifteen lessons.

INSTITUTE OF PRACTICAL ART
Kokomo, Indiana

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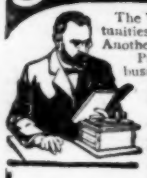

The War has created a great demand and unlimited opportunities for those who know **Spanish, French or Italian.** Another language doubles your commercial value.

Prepare now to better your position or increase your business. Brush up on the language you studied at school or college and make it of practical use. Equip yourself to read foreign books and papers.

You can learn quickly and easily, at home, during spare moments by the

LANGUAGE PHONE METHOD

And Rosenthal's Method of Practical Linguistry

This is the natural way to learn. You hear the living voice of a native professor pronounce each word and phrase. He speaks as you desire—slowly or quickly, for minutes or hours at a time. It is a pleasant, fascinating study; no tedious rules or memorizing. It is not expensive—family and friends can use it. You simply practice during spare moments, and in a surprisingly short time you speak, read, write, and understand a new language.

Our records fit all talking machines. Write for free "Language Treatise," particulars of Trial Offer. Easy payments.

FUNK & WAGNALLS CO., 261 Hess Building, 354 Fourth Av., N. Y.

"I'm A Man. I Want Man's Pay!"

That is what Albert Foster wrote us eighteen months ago, and he goes on: "I'm tired of being bossed for $25 a week. I want a He-Man job with real pay. I want to get into the $100 a week class. Tell me how to do it." We showed him how. Today he has a He-Man job and He-Man pay. We tell of his experience because it's typical.

WHAT ARE YOU? A man who is up and doing, getting real money, or are you simply marking time on $25 or $30 a week? $100 jobs don't go begging. If you want one you've got to go after it. Are you satisfied with your present condition in life? If you are, we have nothing to offer you, but if you want one of these real jobs with big pay, then we can help you and help you in a hurry.

A REAL MAN with a real man's pay is what you want to be, and we will show you how. Without loss to you of a single working hour, we will show you a sure way to success and big pay. A large number of men in each of the positions listed are enjoying their salaries because of our help—we want to help you.

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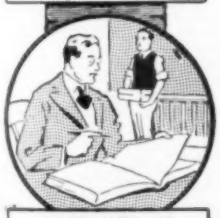
$5000 TO $15000

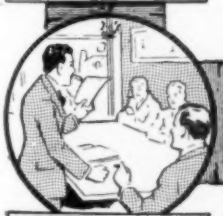
ELECTRICAL ENGINEER
$4000 TO $10,000



ACCOUNTANT
$7000 TO $15000

Make a check on the coupon against the job you want and we will help you get it. Write or print your name on the coupon and send it in today. You will be under no obligation.

American School of Correspondence
Dept. G974, Chicago, U. S. A.



BUSINESS MANAGER
$ 5000 TO $15000

AUTOMOBILE ENGINEER
$4000 TO $10,000

CIVIL ENGINEER
$5000 TO $15,000

AMERICAN SCHOOL of CORRESPONDENCE

Dept. G974, Chicago, Ill.
Explain how I can qualify for position checked:

___Architect $5,000 to $15,000	___Lawyer $5,000 to $15,000
___Building Contractor $5,000 to $10,000	___Mechanical Engineer $4,000 to $10,000
___Automobile Engineer $4,000 to $10,000	___Shop Superintendent $3,000 to $7,000
___Automobile Repairman $2,500 to $4,000	___Employment Manager $4,000 to $10,000
___Civil Engineer $5,000 to $15,000	___Steam Engineer $2,000 to $4,000
___Structural Engineer $4,000 to $10,000	___Foreman $2,000 to $4,000
___Business Manager $5,000 to $15,000	___Photoplay Writer $2,000 to $10,000
___Certified Public Accountant $7,000 to $15,000	___Sanitary Engineer $3,500 to $5,000
___Accountant and Auditor $2,500 to $7,000	___Telephone Engineer $2,500 to $5,000
___Draftsman and Designer $2,500 to $4,000	___Telegraph Engineer $2,500 to $5,000
___Electrical Engineer $4,000 to $10,000	___High School Graduate In two years
___General Education In one year	Fire Insurance Expert $3,000 to $10,000

Name _____

Address _____

Do You Like to Draw?

Here Is a Simple, Easy Way to Draw a Comic Face

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Make a square with pencil, then add to it with pencil as shown in the small squares above. Erase all pencil guide lines after the drawing is completed.

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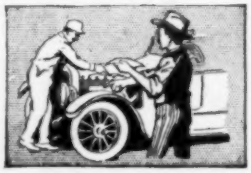

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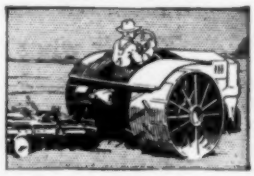

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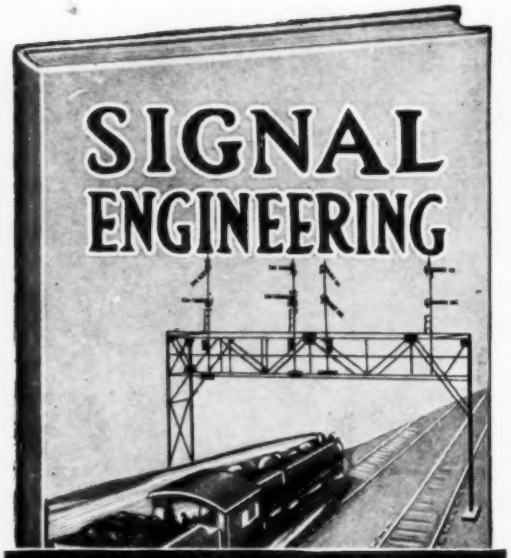

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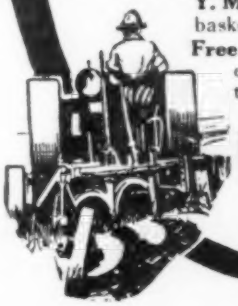

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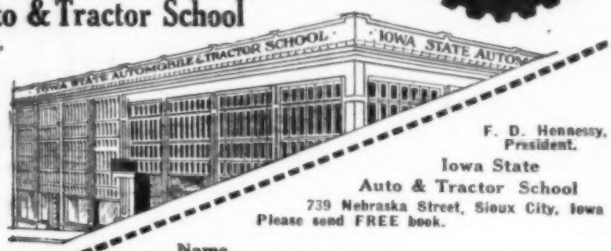

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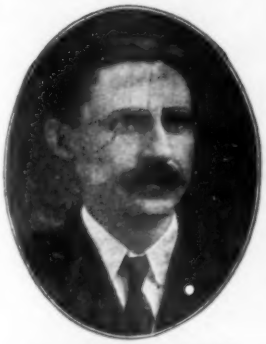

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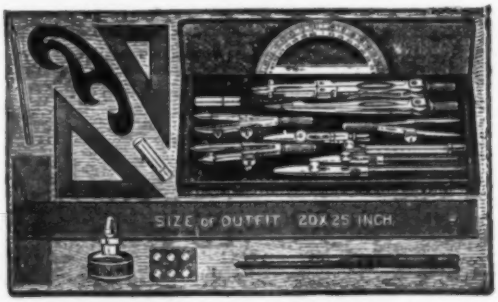

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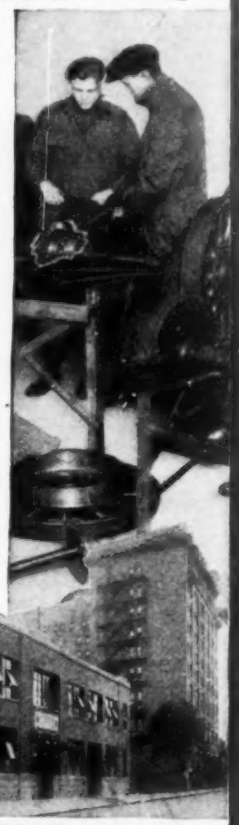

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Why Don't YOU Get Into The Selling Field?

Mr. Overstreet, Mr. Campbell, and the others whose letters you see on this page are all successful salesmen. They have stepped into the $10,000-a-year class — and they never sold goods before! It is hard to believe that such big success could come so quickly and easily. Yet it was all amazingly simple! Ask them the secret of their sudden success. They will tell you they owe it to the National Salesmen's Training Association. This is an organization of top-notch salesmen and sales managers formed expressly for the purpose of training men to sell and helping them to good selling positions. It has taken hundreds of men from all walks of life and made them Master Salesmen—it has lifted them out of the rut and shown them the way to magnificent earnings, to fascinating careers and big selling positions.

We Train You and Help You Land a Job

What these men have done, you can do! In your spare time at home you can easily master the secrets of selling that make Star Salesmen. Whatever your experience has been—whatever you may be doing now—whether or not you think you can sell—just answer this question: Are you ambitious to earn $10,000 a year? Then send me your name quick! I will prove to you without cost or obligation that you can easily become a Star Salesman. I will show you how the Salesmanship Training and Free Employment Service of the N. S. T. A. will help **you** to wonderful success in Selling.

Free Book on Salesmanship

Just mail the coupon or write for our great illustrated Book, "A Knight of the Grip," which we will send you Free. Let us prove to you that regardless of what you are doing now you can quickly become a Star Salesman. Let us show you how you too, can step into the ranks of the big money makers of business. See how easily you can learn this fascinating, big pay profession at home in your spare time. Learn what we have done for others and what we stand ready to do for you. Don't put it off until tomorrow—write us today. Mail the coupon at once.

National Salesmen's Training Association
Dept. 12-W, Monadnock Bldg., Chicago, Ill., U.S.A.

National Salesmen's Training Association,
Dept. 12-W, Monadnock Bldg., Chicago, Ill., U. S. A.

Please send me, without any obligation on my part, your free book, "A Knight of the Grip," and full information about the N. S. T. A. system of Salesmanship Training and Employment Service. Also a list showing lines of business with openings for salesmen.

Name .....

Street .....

City ..... State .....

BE A CERTIFICATED ELECTRICIAN

I WILL TRAIN YOU AT HOME

Three Vital Facts

1. The demand for ELECTRICAL EXPERTS is greater than in any other profession.
2. Electrical Experts earn $3,000 to $10,000 a year.
3. Advancement for the Electrical Expert is certain, and the opportunities for getting into business for yourself are better than in any other line.

Knowing these three facts the thing for every red-blooded ambitious man to consider is where can he get the best practical training in Electrical work. Not a lot of theoretical stuff—but a real practical training that will make him an Electrical Expert in the shortest possible time.

A Real Training

As chief engineer of the Chicago Engineering Works I know exactly the kind of training a man needs to get the best positions at the highest salaries. Hundreds of my students are now earning $3,000 to $10,000. Many are now successful ELECTRICAL CONTRACTORS. Read my students' letters.

Your Success Is Guaranteed

I know what I can do for any wide awake ambitious man, and will absolutely guarantee your SUCCESS or your money returned. No other school will do this for you. Our SHOPS and LABORATORIES are the finest and always open for my students' use.

Fine Electrical Outfit—FREE

I give each student a Splendid Outfit of Electrical Tools, Materials, and Measuring Instruments absolutely FREE. I also supply them with Drawing Outfit, examination paper, and many other things that other schools don't furnish.

Get Started Now—Write Me

I want to send you my splendid Electrical Book and Proof Lessons—both FREE. These cost you nothing and you'll enjoy them. Make the start to-day for a bright future in Electricity. Send in coupon—NOW.

L. L. COOKE, Chief Engineer

Chicago Engineering Works

Dept. 10Y, 1918 Sunnyside Ave.
CHICAGO, ILL.

USE THIS "FREE OUTFIT" COUPON

Chief Engineer
COOKE
Dept. 10Y
1918 Sunnyside Ave.
Chicago, Ill.

Sir: Send at once—fully prepaid and entirely free—complete particulars of your great offer for this month.

Name.....

Address.....

City.....State.....

Read What My Students Say—

"Have just received my diploma, of which I am very proud.

"I think your course is the most complete I have ever seen. I have received my money's worth many times, and any fellow that turns down your offer is sure going to regret it."—Loran C. Brown, Sebring, Ohio.

"Since I started to study with you a year ago I have been doing electrical work in my spare time, made the price of 2 Courses, and have increased my earning power just 100 percent."—Samuel Albright, Riverside, Wash.

"During May I made about $85.00 in my spare time. I can hand you the credit, because when I started I knew NOTHING about Electricity."—L. Randell, Ironton, Minn.

"You will be pleased to learn of my promotion to Chief Electrician. It was your course put me where I am. Although only a little over half through your lessons, I have had my wages raised from $75.00 to $275.00 a month, and expect to do better before I am through."—H. E. Wolf, Columbus, Ohio.

"When I enrolled with you I was only able to make $75.00 a month. Today, thanks to your splendid lessons, I am in business for myself, making over $400.00 a month."—A. Schreck, Phoenix, Arizona.

"Electrical men here speak very highly of your course. One—the Fresno Manager of the General Electric Company—says your course is equal to the three years' training course at their Schenectady shops."—E. Linnville, Fresno, Calif.

"I want to speak a good word in regard to your Course and methods. It has helped me wonderfully. I passed a Journeyman's examination with the International Brotherhood of Electrical Workers, and am now carrying a first-class card."—J. B. Overton, Maryville, Tenn.

"When I enrolled—I knew nothing about Electricity. Today I am the highest paid workman for the Massena Light & Power Co."—C. C. Burkhart, Massena, New York.

"You don't know how glad I am that my son has found such a man as you. I only wish other mothers knew of the interest you take in your students—their boys."—Mrs. S. Williams, Huntington Beach, Cal.

"I am still holding that position with the Minneapolis Steel & Machinery Company, secured on your recommendation."—A. Swanson, Minneapolis, Minn.

"In 18 months since I started to study with you I have increased my salary from $6 a day to $4,000 a year."—A. F. Klemz, State Supt. of Const., Miller-York Co., Saginaw, Mich.

"The outfit is wonderful, so much better than I expected, and I must say I am more than pleased with same."—F. X. Droege, Covington, Ky.

"Before I started to study with you I was only able to make $50 every 2 weeks. Now I am making $300 a month, and going up all the time. Your Course has put me where I am."—J. E. Sallinger, Mine Electrician, New River & Pocahontas Con. Coal Co., Layland, W. Va.

"I would not take 1,000 dollars and be without your course. If I did the years ahead would only be like the few that have passed."—H. Swiger, Wallace, West Virginia.

Complete Letters Sent When You Write Me

YOU CAN DO IT

CLASSIFIED ADVERTISEMENTS

WORLD'S BEST WANT AD MEDIUM

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AUTOMOBILE parts for most any make and model. We save you 10 to 90%. Parts for Argo, Abbott, Allen, American, Apperson, Auburn, Badger, Bell, Bergdoll, Birch, Bour-Davis, Buick, Brush, Cadillac, Carnation, Chevrolet, Case, Chandler, Chalmers, Cole, Columbia, Commonwealth, Crow, Cutting, Davis, Dixie-Flyer, Detroit, Dort, Dorris, Elcar, E. M. F., Elgin, Empire, Everett, Flanders, Federal, Glide, Grant, Hal, Halliday, Harroun, Havers, Haynes, Henderson, Hercules, Hudson, Hupmobile, Imperial, Interstate, Jackson, Jordon, King, Kissell, Kline, Krit, Lexington, Liberty, Little Four, Little Six, McFarlan, Maibohm, Marion, Maxwell, Mitchell, Moline, Monroe, Marmon, Moon, National, Nyberg, Oakland, Overland, Oldsmobile, Paige, Pullman, Partin-Palmer, Palmer-Singer, Pathfinder, Potter, Penn, Peerless, Princess, R. C. H., Regal, Saxon, Scripps-Booth, Selden, Signal, Speedwell, Sphinx, Staver, Stoddard-Dayton, Studebaker, Stutz, Sun, Velie, Warren, Wescott, Metz, and others. Complete motors $40 and up. If you are in need of parts, write us, giving make, model, year, etc. If possible send in old parts and let us duplicate same. We have the parts, can get them or they are not made. Everything sold with a money back guarantee and you are the judge. Auto Tire & Parts Co., Cape Girardeau, Mo.

OLD Auto Engines are valuable to run pumps, lathes and other machinery in place of stationary engine, but they must be governed. We make the governors. Cost only $20 each. Send for booklet C. Candee Smith Governor Co., Springville, N. Y. or Taft, Cal.

FOR Sale—Vulcanizing Outfit for up to date Tire Repair Shop. Bargain. Vulcanizing, 5028 Lake Park Ave., Chicago.

VULCANIZE Rubber boots, rubbers, auto tubes. Best combination machine on the market; 500 per cent profit. Work all the year. Willey Vulcanizer Co., Battle Creek, Mich.

PATENTS procured. Prompt, personal, high class service for discriminating clients. Send invention for actual search. Specialize in motors, attachments and accessories. George P. Kimmel, Master of Patent Law, 2-M Loan & Trust Bldg., Washington, D. C.

TOWLINES Sixteen feet long with hooks. Guaranteed. By Parcel Post $1.50. The Superior Manufacturing Co., 211 High Ave., Cleveland, Ohio.

WANTED—500 men to learn Vulcanizing. Tuition free. No books—Actual tire shop instructions. Splendid opportunity to own a shop of your own. Our $350 complete vulcanizing plant to recommended men on pay-from-profits-plan. Don't delay. Write today for our 50-50 proposition. Willey Vulcanizer Co., Battle Creek, Michigan.

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SPECIAL Sale on all kinds of tires and tubes. New and Retreaded tires. Write for prices. I. Jaffess, 1319 Fifth Ave., N. Y. 241 West 54th St., N. Y.

CARBON Remover that works. Full sized package 75c prepaid. Discount in quantities. Complete formula $2.50. B. B. Specialties, Boonville, Mo.

MAKE your car ride easier. Oil your springs. Send me $5 for set of oilers. State make and model of car. Booklet on request. W. Grus III, 505 Clinton Ave., Oak Park, Ill.

CANADIAN lists of automobile owners, agents, garages, repairers, dealers, $3 per 1,000. Lasnier Agency, Bathurst, N. B., Canada.

NEW Auto Specialty: New Luggage Carrier every Auto owner buys on sight. Nothing like it on Market. Guaranteed. Sample $5. Agents Wanted. Auto Specialty Co., 424 Ave. A, Schenectady, N. Y.

NEW Midwest Utilitors $275. H. A. Jacobs, Box 109, Savannah, Ga.

RESPONSIBLE State Agents for new auto accessories in class by themselves. Beldville Mfg. Co., 141 Broadway, New York.

BARGAINS: Any accessory 25% less than retail. State requirements, get prices. Bargain Auto Parts Co., 105 W. Monroe, Chicago.

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50 SETS of Jubilee Spark Intensifiers—Jubilee Spark Plugs—2 in 1 Spark Plugs—Gross Bull Dog Chain Fasteners. All New. No reasonable offer refused. H. Davis Ackerly, Northport, New York.

NOTICE to auto owners using Five Inch Tires and under. My invention will give at least Twenty Thousand Miles per Tire, eliminate blow outs, reduce punctures ninety per cent. Cost not to exceed half price of one tire. You can apply it yourself. Absolute guarantee or money returned. For illustrated instructions send one dollar to B. F. Spencer, Box 213, Los Angeles, Calif.

INSYDE Tyres, inner armor for automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Costs little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept T-1692, Cincinnati, O.

WHAT do you need? We have it. Gray's Auto Parts Company, 3212 Brighton Road, Pittsburgh, Pa.

MAGNETO Rechargers for all magnetos, including Fords, while in car. Generates 50 pounds magnetic pull from four dry cells, $6.25. Thousands in use. Circular. Benner Mfg. Co., Webb City, Mo.

BUILD your own Phonograph. Big saving, pleasant, instructive work. Complete instructions, blue-prints, etc., absolutely free. Associated Phonograph Co., Dept. P-3, Cincinnati, Ohio.

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NEW Departure Spark Plugs. Heavy duty. Two-piece Insulator. Extra Insulator free. Send $1.00 for best spark plug value ever offered. Marvel Mfg. Co., Bridgeport, Conn.

AUTOMOBILE Parts for all cars 50% off manufacturer's list price. Buicks, Maxwells, E M. F., Cadillac, Parry, Regals, Oaklands, Jefferys, Studebakers, Flanders, Paiges, Overlands, Mitchells, Chalmers, Auburns, Jacksons, Interstates, Marions, Coles, Molines, Stearns-Knights, Ramblers, Thomas, Imperials, Lexington, Moon, Hudsons, Everetts, Stutz, Reo, Kissels, Hupmobiles, Bergdolls, Ohio, Velie, Dorris, Speedwell, Halladay, American-Underslung, Elcar, Haynes, Marmon, Vim, Allens, Pullmans, National Empire, Detroiter, Marathon, Warrens, Case, and many others. Pistons, Connecting rods, cam shafts, crank shafts, cylinders, axles, bearings and gearings; also, new rear axle and transmission gears for any make car. Write us your needs; service and satisfaction guaranteed. Auto Parts Company, Sales Department, St. Louis, Mo.

AUTO Top Roof Covers $7. up. Any model car. You save 2/3 price of new top. Easy to apply. Jiffy Seat Covers clean and cool in summer and clean and warm in winter. Washable. On and off in a jiffy. We deliver parcel post prepaid. Samples free. Auto Equipment Co., 52 Canal St., Cincinnati, Ohio.

BULL-DOG Inner Tires molded to fit your casings. Practically eliminates Blowouts and Punctures. Doubles the life of your tires. Wonderful seller and repeat order getter. Write for particulars today. Agents making $5,000 to $10,000 a year. Eastern Auto Specialty Co., Dept. A. Utica, N. Y.

TIRES—Direct to You Prices. Exclusive representative wanted each locality to use and sell the new Mellinger Extra Ply Tires (no seconds). Guarantee Bonds 8,000 Miles. Sample Sections furnished. Mellinger Tire Company, Kansas City, Mo.

AUTOMOBILE Parts for all cars 50% off manufacturer's list price. Buicks, Maxwells, E. M. F., Cadillac, Parry, Regals, Oaklands, Jefferys, Studebakers, Flanders, Paiges, Overlands, Mitchells, Chalmers, Auburns, Jacksons, Interstates, Marions, Coles, Molines, Stearns-Knights, Ramblers, Thomas, Imperials, Lexington, Moon, Hudsons, Everetts, Stutz, Reo, Kissells, Hupmobiles, Bergdolls, Ohio, Velie, Dorris, Speedwell, Halladay, American-Underslung, Elcar, Haynes, Marmon, Vim, Allens, Pullmans, National Empire, Detroiter, Marathon, Warrens, Case, and many others. Pistons, Connecting rods, cam shafts, crank shafts, cylinders, axles, bearings and gearings; also, new rear axle and transmission gears for any make car. Write us your needs; service and satisfaction guaranteed. Auto-Parts Company, 327 West Second St., Davenport, Iowa.

AUTO Motor Supplies—Buick—Michigan—Stoddard Dayton—Cadillac-Overland—E. M. F., Continental and Buda Motors, all types, $50 each and up. Special high tension 2 and 4 cylinder Magnetos $9.50 each. Electric and Gas Head Lamps—Coils—Carburetors—Air Compressors—Generators—Starters, etc. Write for catalog. Address Motor Sales Dept. 15, West End, Pittsburgh, Penna.

VULCANIZER for shop use. Vanderpool's, Springfield, Ohio.

BLUEPRINTS—Automobile generator armature. See ad under "Electrical." Charles Chittenden.

PEEJAY step-cut piston rings for all makes automobiles. Phil. Jacobs, Portsmouth, Ohio.

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CYLINDERS reground, new pistons and rings fitted. Restores lost power. Write for prices, giving make and model. The Evarts Machine Co., Hartford, Conn.

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HOLMES Front Pull Automobiles have hundred advantages over any other car in safety, speed, endurance, economy and ability to meet worst road or weather conditions. Absolutely satisfactory, growing popularity, simple standardized construction, low prices. Choice exclusive territory, offering vast opportunities without competition, open to responsible, aggressive representatives qualifying. Wire or write for reservation. E. R. Holmes, Box 213, Detroit, Michigan.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost litle. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. T-1712, Cincinnati, O.

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PATENTS—Write for our free illustrated Guide Book and Evidence of Conception Blank. Send model or sketch and description of your invention and we will give our opinion of its patentable nature. Highest references. Prompt service. Reasonable terms. Victor J. Evans & Co., 185 Ninth, Washington, D. C.

OLD Auto Engines are valuable to run pumps, lathes and other machinery in place of stationary engine, but they must be governed. We make the governors. Cost only $20 each. Send for booklet A. Candee Smith Governor Co., Springville, N. Y. or Taft, Cal.

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FARM with Your Ford. Do 2 days work in 1. The Adapto-Tractor makes your Ford a tractor and a power plant. Guaranteed to be as represented and not to injure your Ford or your money back. Agents wanted. Write for free circular. Geneva Tractor Co., Dept. P., Geneva, Ohio.

FORD Car Repair Book sent free. This complete, well illustrated, valuable book explains in a simple way the Causes and Cures of Overheating; Repairing Ford Timer; Curing Piston Ring Troubles; Carburetor Adjustments and Repairs; Connecting Rods; Transmission Troubles; Care and Repair of Rear Axle; Stopping Axle Grease Leaks; also covers practically every other phase of Ford Car Repairing. Send 25c coin for three months' trial subscription and get the valuable repair book free. Ford Owners' Magazine, 506 Montgomery Bldg., Milwaukee, Wis.

"THE Litl Shofur" safety steering device for Ford Cars, operates without coiled springs, bearings, cams, or other wearing parts. Thousands sold and only $3 each. Agents wanted everywhere. Powel Crosley, Jr., T-1632, Cincinnati, O.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. T-1732, Cincinnati, O.

MAKE your Ford Smart Sport Car; snappy aerotail body; Fiat design radiator; graceful stream line aero rear; low metal skirt concealing Ford frame; produces $2,000 appearance. Complete with underslung fixtures lowering frame four inches. Introductory offer Agents $157.50. Complete line speed and power equipment. 16 valve Cylinder Head; 4 Speed Transmissions for speed or truck use. Catalog. C. M. Ford Speed & Power Equipment Manufacturers, 250 West 54th, New York.

COMPLETE line of Spiral Fluted Reamers fitting every bearing and bushing on a Ford Automobile. Catalogue and prices on request. Guaranteed Spiral Reamer for Spindle Bushings $1.40 postpaid. E. M. Wright, 25 N. Pearl St., Albany, N. Y.

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BIG Profits Reboring Cylinders. Growing Business. Quick Money. Request Circular describing our $20 Ford Cylinder Reboring Tool. Goruse Company, Elmira, N. Y.

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SAVE hundreds of dollars on repair bills by using Ideal Shock Absorbers on your Ford car. Installed in twenty minutes. Satisfaction guaranteed. Free trial. Agents wanted. Ideal Products Company, 1467 East Jefferson Ave., Detroit, Michigan.

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200% MORE light with both headlights burning. Install a 4-A Equalizer and Dimmer on your Ford. Not a plug or socket device to injure magneto and burn out globe, but a scientifically constructed instrument successfully sold and used by thousands of Ford dealers and owners for several years. Guaranteed to outlast your car. Don't buy a cheap inferior makeshift, imitation or substitute. Insist—get the genuine 4-A Dimmer Equalizer. Order direct if your dealer can't supply you. Sent prepaid on receipt of $6.00, retail price. The 4-A Products Company, 3100 Downing, Denver, Colorado.

AUTO-TOP and Seat Covers $7 up—parcel post, prepaid. Easy to apply. Catalogue and samples free. Auto Equipment Co., 18 Canal, Cincinnati, O.

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MOTORCYCLE Sidecars—a small number of brand new cars, never out of crate, that I purchased just before prices advanced. Must sell quickly to raise money and will let you have one for $25 less than the present price of such a car. Write for detailed description. Melvin Hoyer, Loudonville, Ohio.

PARTS for all makes of motorcycles. Largest stock in the Middlewest. Lowest prices. Rush service on mail orders. Nebraska Motorcycle & Bicycle Co., Motorcycle Building, Omaha, Nebr.

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SAVE 20% on New Excelsior and Henderson Parts. We carry the most complete stock in the United States. Orders filled the same day as received. Also large assortment of slightly used parts for all makes of Motorcycles at half price. Haverford Cycle Co., Dept. P. 503 Market Street, Philadelphia, Pa.

USED Motorcycle Buyers, Attention—We can save you from $35 to $50 on any motorcycle you purchase of us. 100 late model machines, all makes, $25 up. Write for catalog. Myerow Bros., 258 Columbus Ave., Boston, Mass.

CLEANUP Sale, we need space: Late Henderson "Special" 3 speed big motor, guaranteed perfect throughout, speedometer, Electric equipped, klaxon, large tool box, Goodyear tires, with "New Rogers" side car $385.00. Big Power plus Indian 3 speed Bosch magneto, Schebler carburetor, prestolite outfit, perfect condition $155.00. Harley Davidson 3 speed electric equipped positively A-1 condition $195. Henderson 2 speed, Bosch Mag. $155. Ex. Twin 3 speed $145. Harley D. three speed $135. For others, stamp brings list. Side cars, all makes. Engines for sleds, and planes etc. $15 and up. Parts at big discount. Magnetos, Generators, Carburetors etc. We want motorcycle parts and side car parts. What have you? State lowest prices in first letter. Write Erickson, 8039 Parnell Ave., Chicago.

INDIAN 1915 twin 10 H. P. Prestolite equipped tandem tools, excellent shape $125. 2305 So. 9th Phila., Pa.

HARLEY-DAVIDSON 1916 three speed with Side-Car, Prestolite equipped, tandem, speedometer. Good shape, $275. 2601 Reed, Phila., Pa.

FOR Sale—1919 Indian motorcycle, also side-car and 22 Winchester automatic rifle. E. A. Warring, Box 218, Parkersburg, Iowa.

BICYCLES $10. Chainless $25. Tandems $35. Frames, repairing. McDougald, 300 N. Wells St., Chicago.

SEND for big list of slightly used motorcycles and bicycles on our easy payment plan. Howard Cycle Co., 152 N. Broad St., Trenton, N. J.

WE make a specialty of supplying Harley-Davidson parts for all models from 1902 to 1921. Mail thirty-five cents in stamps for complete parts book and prices. Shipment made within 10 hours. Mail two cents in stamps for circular of rebuilt motorcycles and sidecars, including Harley Davidson, Indian and Excelsior. Guaranteed and shipped on approval. Return machine if not satisfied. Liberty bonds accepted at full face value. Wisconsin Cycle Sales Company, 726 National Ave., Milwaukee, Wis. Oldest and largest dealers in the northwest.

$25.00 UP, guaranteed rebuilt motorcycles. Henderson, Excelsior, Indian, Harley-Davidson. Bicycles, $5.00 up. Tires and accessories at wholesale. Illustrated bulletin A sent free. Ash Motor Corporation, 162 N Clinton Ave., Rochester, N. Y.

USED Parts—You save half to two-thirds of your money. Written or wired orders filled daily. Parts for Harleys, Indians, Thors, Excelsiors, Yales, Hendersons, Daytons, Merkels, De Luxe and Reading-Standards. Schuck Cycle Co., 1922 West Lake, Seattle, Wash.

MOTORCYCLES, $40.00 up. Motor Attachments, Bicycles, Repair Parts and Supplies at extremely low prices. Send for our Big Bargain Bulletin, and our "Money Saving Message to the Motorcyclist." It will save you money on motorcycles, supplies, tires, etc. American Motor Cycle Company, Chicago.

USED Motorcycles, all makes, $75 and up. Howard A. French & Co., 304 W. Baltimore St., Baltimore, Md.

DON'T buy a Bicycle Motor Attachment until you get our catalogue and prices. Shaw Mfg. Co., Dept. 27, Galesburg, Kans.

BIG bargains in good motorcycles we have taken in exchange on new ones. Send for special bargain list. Shaw Mfg. Co., Galesburg, Kansas.

MOTORCYCLE Cylinders reground, fitted with new piston rings, $7.00, guaranteed. Muncie Piston Co., Muncie, Ind.

USED and New Parts for Indians, Harleys, Excelsior, Pope, Yales, Deluxe, Henderson. Get our prices on your motorcycle parts and accessories. Kingshighway Motor Cycle Co., 1166 N. Kingshighway, St. Louis, Missouri.

WELDING

"UNIFLUX" Remarkable Flux Welding Compound Easy welding. Stronger welds, less cost. Request Circular or send 10c for Sample. Goruse Company, Elmira, N. Y.

ELECTRIC Motors two and five horse power. Hobartsons, Troy, Ohio.

A LIGHT welding and lead-burning torch combined, built on the most scientific principles. Price $7.00 delivered. Also acetylene brazing and soldering torch, nickel-plated, fiber handle, finest torch built, price $1.50 delivered. Marshall Mfg. Co., 1209 Grand Ave., Kansas City, Mo.

FOR Sale—Welding Flux Formulas for Cast Iron, Bronze and Aluminum. Will send the 3 for $5.00. Arthur E. Biggins, 423 Monadnock Bldg., San Francisco, Calif.

DON'T scrap aluminum parts. Save them with So-Luminum. New, great welding solder, stronger than aluminum, perfect substitute for acetylene welding—¼ time and cost. Use gasoline torch or soldering iron. No flux required. Booklet on request. Sample bar $1.00. Used and endorsed by United States Army and Navy and British Munitions Board. So-Luminum Manufacturing Co., 1834 Broadway, New York.

VULCANIZER for shop use. Save 20 per cent. Equipment Company, 9 Canal St., Cincinnati, Ohio.

WELDING Plants for all purposes. Small payment, balance six to ten months. Apparatus guaranteed for one year. Write Bermo Company, Cedar Rapids, Iowa.

MENDALL Metal—Now used in thousands of garages for permanent repair of cracks and holes in cylinder heads, motor blocks, water jackets, etc. Fluxates with any metal at only 250° heat. No danger of warping parts. The mend will withstand 600° heat and 1,200 pounds pressure. Any part accessible to blowtorch flame mended in place. Blowtorch only tool required. No acid or salts necessary. Money-back guarantee. Garagemen, write for particulars, 4-A Products Co., Dept. M. M., Denver, Colorado.

AVIATION

"CURTISS" or Hallscott Motored Tractor Biplane. Passenger Model. Economical design. Wing Fittings, $1. Fuselage Fittings, 50c. Motors $200, up. Practical Plans and Flying Instructions, $10. Aviation Engineering Co., Lawrence, Kansas.

PATENTS procured. Prompt, personal, high-class service for discriminating clients. Send invention for actual search. Specialize in motors, attachments and accessories. George P. Kimmel, Master of Patent Law, 3-M, Loan & Trust Bldg., Washington, D. C.

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THIO-DERM, Lightning Healer, surface injuries and ailments, cuts, burns, boils. Liberal offer. Thioco, Box 169, Jersey City, N. J.

AGENTS—New business. Make $5 hour. Hurry. Texply Co., Box 8, Somerville, N. J.

$15.00 FOR a Made-to-Measure Two-Piece Suit, the biggest bargain offer ever made by any tailoring house. We are out to beat high tailoring prices. Save 50% on your next suit. You can easily earn $60.00 cash weekly in your spare time by taking orders for our celebrated made-to-measure clothes. Write us Today for our beautiful cloth samples and wonderful offer—sent Free Postage Prepaid. Act Quick. The Progress Tailoring Co., Dept. 801, Chicago, Illinois.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business; write for free samples showing finishes, etc. Gunmetal Co., Ave. H, Decatur, Ill.

AGENTS for scientific, useful, health-giving, pain-relieving Therapeutic Lamp. Will eventually be used in every home. Endorsed by physicians. Surpasses sales possibilities of vacuum cleaners, washing machines, cash registers, etc. Big returns. Selling our lamp is as commendable as work of nurse in sick room or on battle front. No competition. Exclusive agencies given. Send for catalog, prices. Sterling Pain Relieving Lamp Co., Department 102, 546 Garfield Ave., Chicago.

PHOTO Pillow Tops, Portraits, Frames, Sheet Pictures, Pennants, Patriotic Portraits and Pictures; Medallions, War Books, Novelties. Prompt shipments; samples and catalog free. 90 days' credit. Jas. C. Bailey Co., Desk E-6, Chicago, Ill.

BIG Profits Selling New $3.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Company, 1458-D, Hollywood Ave., Chicago.

100 AGENTS wanted immediately to get orders for our Magic Washing Compound. Easiest seller. Sure repeater. Territory going fast. Barnes & Whyard, 222 W. 69th St., Chicago.

PORTRAIT Agents—A new portrait. Something entirely different. Write for particulars, also catalog and price list. Fidelity Portrait Co., Dept. 100, 3047 Harrison St., Chicago, Ill.

AGENTS: Sell full line of guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles, colors and finest line of silk hose. Often take orders for dozen pairs in one family. Permanent customers and repeat orders make you steady income. Write for sample outfit. Thomas Mfg. Co., Class 462, Dayton, Ohio.

AGENTS—Self-Threading sewing needles find a sale in every home. Fine side line, easy to carry, sure repeater. Sample and particulars free. Lee Brothers, 141 East 23d St., New York, N. Y.

AGENTS, 200% Profit. Wonderful little article. Something new; sells like wildfire. Carry right in pocket. Write at once for free sample. Albert Mills, Mgr., 2325 American Bldg., Cincinnati, Ohio.

PATENTS—Book Free. Send sketch for free opinion of patentable nature. Talbert & Talbert, 4842 Talbert Bldg., Washington, D. C.

WONDERFUL proposition to substantial agents. Farmer's necessity—outfit to workers. A. D. Rhein, 1533 Michigan Avenue, Chicago.

AGENTS—We pay $6 a day taking orders for New Kerogas Burner. Fits any stove. Burns coal oil. No experience or capital required. Work spare time or full time. Write for demonstrating sample. Thomas Mfg. Co., Class 2662, Dayton, Ohio.

AGENTS coin money selling Brussels Fibre Brooms. Triple-value corn broom. Sample postpaid $1.00. Also Cramer Sanitary Brushes. Cramer Co., Wichita, Kans., and Cincinnati, Ohio.

AGENTS, Demonstrators, sell aluminum solder; unequaled for all metals. $2.75 per gross; direction on envelopes included. Wm. Stoll, 819 East Illinois St., Evansville, Ind.

150% PROFIT. Fast selling household, store and office necessity. Sure repeater. Write for free sample. Chapman Company, Dwight Bldg., Kansas City, Mo.

LARGE manufacturer wants agents to sell guaranteed made-to-measure Raincoats. $50 to $75 weekly. Highest commission. Profit in advance. Outfit free. Standard Raincoat Co., 163 W. 21st St., New York, N. Y.

150% PROFIT selling New Method Embroidery Needle. Sample and two embroidered exhibits $1.00. Write today. Eugene Marquis, 5200 North Keystone, Indianapolis, Indiana.

NAPTHA Washing Tablets sell and repeat in every home. Pay agents immense profit. Free sample. Peerless Tablet Co., Ligonier, Ind.

FAST Selling Sanitary Brushes, Mops, Dusters. Best house-to-house line in America. Send for free circular, "How to Make $100.00 a Week." Sanford Brush Co., 544 W. Lake St., Chicago.

AGENTS, you can make $$$ with our line of specialties. Send name and address today for full particulars. J. M. Northen & Co., Walnut Ridge, Ark.

SALESPEOPLE to represent manufacturer of Sanitary Comfort Specialties that everybody needs, wants and buys. Excellent opportunity. American Rubber Products Company, 608 Fifth Ave., Pittsburgh, Pa.

ANY man handy with paint brush can start new mechanical business needed everywhere; nearly all profit; experience or capital not required. John Braceland, 1457 S. Ninth, Philadelphia, Pa.

START in a permanent business of your own, selling guaranteed Hosiery and Underwear direct from mills. No capital or experience needed; many representatives make $3,000 to $5,000 per year. Become our district manager—get others working for you. Write for details to Malloch Knitting Mills, 5012 Grant St., Grand Rapids, Mich.

BIGGEST Money-Maker in America. I want 100 men and women quick to take orders for raincoats, raincapes and waterproof aprons. Thousands of orders waiting for you. $2.00 an hour for spare time. McDonough made $813.00 in one month. Nissen $19.00 in three hours. Purviance $207.00 in seven days. $5,000 a year profit for eight average orders a day. No delivering or collecting. Beautiful coat free. No experience or capital requird. Write quick for information. Comer Manufacturing Co., Dept. U-132, Dayton, Ohio.

SPECIALTY Men: Sell the "Welcome Guest," latest thing in Men's Neckties. Big holiday seller. Attractive, convenient, economical. Low first cost. Sample for one dollar. Guest Tie Co., Rochester, N. Y.

AGENTS make big money selling the world's greatest "Shoe Saver." No competitive article obtainable. Write today for particulars. Peerless Mfg. Co., W. Chicago, Ill.

AGENTS—Sell rich-looking imported 36x68 rugs, $1 each. Carter, Tenn., sold 115 in four days. Profits, $57. You can do same. Write for sample offer selling plan; exclusive territory. Sample rug, prepaid, $1.39. E. H. Condon, Importer, Stonington, Maine.

SASCHA Cocoanut Oil Shampoo in granualr form, sells in every home and always repeats. Agents make 100%. Send for sample and full information. United Pure Food Co., 139D Franklin St., New York.

"LITTLE Wonder" Crown Capping Machines sell to every housewife; equal in efficiency to expensive power machines. Fast sellers. 100% profit. Agents, Dealers write. Mincke, Alhambra, Calif.

AGENTS—Make $2 an hour selling useful 25c article, needed in every home. Repeats weekly. Palace Mfg. Co., Toledo, O.

AGENTS' Directory, listing 1,000 first-hand supply sources; Mail Order-Agent Specialties; 128 pages, latest edition; postpaid 25c. Swanson, 1205P Kansas Ave., Kansas City, Kans.

VALUABLE Books. Catalog free. Garner, 4075 South Hoover, Los Angeles, Calif.

GET the big profits yourself. Put up and sell your own goods from my guaranteed, tested formulas. Why work for someone else when you can manufacture the goods yourself and make all the profit? My extremely interesting booklet will open your eyes to a wonderful opportunity. Write for a copy today. It's free. Address, Thomas Steel, 1333 East Franklin, Richmond, Va.

POLMET Polishing Cloth cleans all metals. Retails 25 cents. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

$60 WEEKLY easy, selling big variety Sanitary Brushes everybody uses. Neway Brush Co., Hartford, Conn.

WHY work for someone else when you can easily make all the profits yourself? Put up and sell your own goods from guaranteed tested formulas. My extremely interesting booklet will open your eyes to a wonderful opportunity. Write for a copy today. It's free. Thomas Steel, 1333 East Franklin, Richmond, Va.

AGENTS wanted. Sell our talking machine needles, record cleaners, etc. $10.00 per day easily made in spare time. Our complete outfit puts you in business for yourself. Costs you $9.90. Sells for $19.80. Every home that has a talking machine needs something you have to sell. Wade Talking Machine Co., 12 N. Michigan, Chicago.

AGENTS—Biggest 20c seller. Orders come to you every week. Profits very big. New selling plan free. No experience necessary. The Poflow Co., Dept., 87, 25 E. 26th St., New York City.

LIVE agents wanted selling "Serviceable Combination Belt." 100% profit. Fast seller. Send $2.98 for sample. Serviceable Merchandise Co. (unic) Dept. PM. 30 N. Michigan Ave., Chicago.

INSYDE Tyres, inner armor for Automobile tires, double mileage and prevent punctures and blowouts. Quickly applied. Cost little. Demand tremendous. Profits unlimited. Details free. American Automobile Accessories Co., Dept. P., Cincinnati, O.

AGENTS 500% profit—Gold Letters for store office windows; easily applied; will not wash off; free samples. Acme Sign Co., 848 N. Wells, Chicago.

200% PROFIT selling "999" Patent Polish. Quick seller, enormous repeater. Best, easiest working polish for automobiles, pianos, furniture, etc. Sell wholesale and retail. Damon Manufacturing Company, 901 Rush St., Chicago.

AGENTS: Selling Magic Windshield Cloth, the Wonder of the Auto World, will make you $75.00 per week. Write for proposition. United Sales Co., Aberdeen, S. Dak.

WANTED—Tailoring Sales Agent—Make big money from very start—$60.00 to $75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of five hundred woolens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars giving your experience as salesman or tailor's sales agent. H. F. Foster, Sales Manager, Lock Box 483, Chicago.

$6,000 A YEAR is your profit from 4 sales a day. Davidson sold 96 one week. No experience needed. The Aladdin light is a sensation wherever introduced. Five times as bright as electric. Won Gold Medal. Farmers have the money; they need this light and 9 out of 10 will buy. Also big opportunity in small towns and suburbs. Excellent spare time and evening seller. No capital required. Sample on free trial. Write for agency proposition while territory still open. Mantle Lamp Company, 523 Aladdin Bldg., Chicago.

REAL Honest To Goodness Start. That's what I've given hundreds of Agents, Small Manufacturers with limited capital, desiring to make their own high-class, big selling Specialties in all lines. With my Correct Formulas they soon realized that manufacturing is where the money is. My Valuable Literature descriptive Cocoanut Creme Custard, Alimixt Cake, Vanilla Concentrate, Chocolate Milk Beverage (powdered), Non-alcoholic Flavors — Pie Fillers — Cero Fruit Butter, Magico Windshield Cloths, Ovitone Doubles Egg Production, Latest Washing Tablets, Powders, and hundred other valuable manufacturing propositions for Stamp. Miller, Chemist, Tampa, Fla.

WHY not "Sell for the people that help you sell"? We furnish Free newspaper advertising for agents selling "Wynolyn" 9 Toilet preparations. Quick particulars Free. Wynolyn 9 Co., Covington, Ky.

IDEAL Sideline, $1.00 Specialty, Patented. Sample Free. K. Home, 1957 Warren, Chicago.

NEED—A Windshield Cleaner. One rub keeps Windshield clear 24 hours from rain, snow, sleet and fog. Fastest selling auto accessory. Agents big profit. Auto Owners Supply Co., Davenport, Iowa.

PUTS Life in Lazy Gasoline. Spark intensifiers, other specialties. Write for free sample. Others clearing $1000.00 monthly. Big money for agents. Jackson Mfg. Company, 1818 Curtis Street, Denver, Colorado.

AGENTS—Buy direct from largest manufacturer in the country—non-alcoholic flavoring extracts, perfumes, soaps, baking powder, rust remover—over 250 items. Money-back guarantee with every one. Exclusive territory. Big commission. Pitkin, 212 Com'l Bldg., Newark, New York.

$15.00 DAILY selling the New Amberoid Unbreakable Combs; kind you can hit with a hammer; write for wholesale prices. Geo. Bucknam, Box 2792, Boston, Mass.

AGENTS sell Laundry Tablets under your own name and brand. Free samples and circulars furnished with every order. Particulars free, sample fifteen cents. Write today. Krebs A Products, College Point, N. Y.

$11.00 A DAY for 5 hours' work. New method—no capital required—no deliveries—no delays—just take orders and bank big profits. Davis Products Co., Dept. 506, Chicago

AGENTS—Big Profits selling "Wunrub Polish" for Autos, Furniture, etc. H. H. Fritch, 6431 Magnolia Ave., Chicago, Dep't A.

AGENTS make 500% profit handling Auto Monograms, New Patriotic Pictures, Window Letters, Transfer Flags and Novelty Signs. Catalog sent Free. Hinton Co., Star City, Ind.

BUILD and sell Phonographs. Big saving, pleasant, instructive work. Complete instructions, blue-prints, etc., absolutely free. Associated Phonograph Co., Dept. P-1, Cincinnati, Ohio.

AGENTS make big money because sales may be made in every home. Our modern aids to home sanitation have an appeal that cannot be resisted. A brush, mop or duster for every need. Liberal commissions and good territory. North Ridge Brush Company, 135 Clark St., Freeport, Ill.

MAKE $10-$20 day selling Guaranteed Hosiery and Underwear in homes and offices. Beautiful sample outfits—liberal commissions—prompt deliveries. Write for Sure Success Plan. C & D Co., Section D, Grand Rapids, Mich.

SAFETY First—Something new, in a class by themselves, "Clayco" glassless Wind Wings, Tonneau Shields, Sun Shades for Automobiles. Limited territory. Agents handling Clayco products are making money. Write today, Dept. 7, McClay Mfg. Co., 3675 Moneta Ave., Los Angeles, Cal.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., 201 Olive, St. Louis.

FOOD Products Toilet Preparations, Soft Drink Extracts—big house-to-house sellers. Agents wanted. Fletcher Production Company, 415 E. 69th, Chicago.

AGENTS!—A New One! Harper's Fibre Broom and Ten-Use Brush Set combined. Saves broom expense; lightens housework; easy seller; first order returnable. Harper Brush Works, Dept. X, Fairfield, Iowa.

YOU can be your own boss with our Key Check outfit. Good for $5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge $1.50; make $1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

500% PROFIT selling Kvale's Ink Tablets. Whirlwind seller. Every business house, school, home a customer. Build big business. Tremendous repeater. Quart package, 25c. Sample free. Kvale Ink Co., 8 So. Dearborn, Chicago.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

MEN, get into the wonderful tailoring agency business, big profits taking orders and your own clothes free. We furnish fine sample outfit and everything free. No experience needed. Write today. Banner Tailoring Co., Dept. 650, Chicago.

BIG Repeat Orders come easy to Ho-Ro-Co agents. Start now with this quick-selling line of soaps, toilet articles, and household specialties. Goods well known, profit 100 to 140 per cent. Our guarantee backs every product. We help you build a big-paying business. Experience is unnecessary. Spare or whole time will bring in money every day, because users recommend Ho-Ro-Co products to friends. Be independent! Start today to make a regular growing income in this pleasant way. Good territories going fast. Write today for free sample case offer. Ho-Ro-Co., 103 Locust St., St. Louis, Mo.

AGENTS—Roth spark intensifier; Ford cars; intense spark; more power; huge profits. P. Kelly, Mfr., 5 S. 10th, St. Louis, Missouri.

AGENTS, Big Profits. Gold Sign Letters, easily applied. Best and cheapest manufactured. Samples free. Interstate Sign, Dept. C, 2620 N. Halsted St., Chicago.

AGENTS: $40 to $100 a week. Free samples. Gold sign letters for stores and office windows. Anyone can do it. Liberal offer to general agents. Metallic Letter Co., 431E N. Clark, Chicago.

THE World Astonished at our discovery of new Sugar. Fortune selling it. New on market. Act quick. Empire Laboratory, M, 1217 N. Paulina St., Chicago.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-5, 57 East 18th St., Chicago, Ill.

AGENTS—$100 a week. No competition. E. Huggard, Box 137, Seattle, Wash.

TAILORING Agents Wanted—Big complete sample outfit and case, nearly 200 large cloth samples, 3-price lists and everything needed for canvassing, or use in store, free to live agents. $25.00 to $50.00 a week; may make more. Write us today for free elegant outfit to begin, cloth samples, wholesale prices, special offer on a suit for yourself and full information. See our wonderful values, beautiful fabrics and styles. Established 28 years. Every garment made to measure—everything guaranteed and express prepaid. Just send a postal. American Woolen Mills Co., Dept. 1438, Chicago.

WANTED—Agents and Representatives to sell the Famous "Everloc" Tire Patch; also other new and attractive accessories in this section of the country. Big money for hustlers. Write to W. C. Wood Company, 107 Western Ave., Minneapolis, Minn.

AGENTS—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 505.

MAKE $2 an Hour. Article that removes iron rust, grass, medicine, fruit, mildew stains. Cleans Panama and Straw Hats. Bleaches clothes. Sells Every home. Write for free demonstrating outfit and start taking orders at once. Christy, 81A Union, Newark, New York.

WORLD'S Fastest Selling Auto Accessory! County Distributors wanted; write today. G. L. W. Spring Oiler Co., San Diego, California.

$500.00 MONTHLY selling new patented fuel Vaporizer, guaranteed to save up to 50% gasoline. 40 miles per gallon made with Ford. Sold on money back guarantee. One sample free. Stransky Vaporizer Co., 98 Pukwana, S. Dak.

YOU can letter Automobiles, Doors, Trunks, etc., without any previous experience by Transfer Process. Make $27.50 on $2.50 Outfit. Auto Monogram Supply Co., 16 Green St., Newark, N. J.

AGENTS Wanted — Economy Kerosene Burners for cooking and heating stoves and furnaces. Big profits. Exclusive territory. Economy Mfg. Co., Dept. D, 616 W. Monroe St., Chicago, Ill.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

AGENTS make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

SELL Necessities. Everybody needs and buys the "Business Guide." Bryant cleared $800.00 in July. Send for sample. It's Free. Nichols Co., Box 4-B, Naperville, Ill.

ONE Sale a Day means $200 per month! Five a day—$1,000 per month!! Marvelous new Automatic Adding Machine, retails $12.50. Work equals $300 machine. Five Year Guarantee. Write quick for protected territory and trial offer. Calculator Corp'n, Dept. F, Grand Rapids, Mich.

SELL World's Greatest Auto Invention; wonderful Mystic-cleaner prevents rain blurred windshields; one application keeps glass clear 24 hours; fits vest pocket; ornamental steel mounting; agents amazed; Vetter made $75 first day. Security Mfg. Co., Dept. 279, Toledo, O.

TAILORING Salesmen and hustlers without experience, to take orders for large wholesale tailors in factories, shops, etc. All or spare time. Wonderful opportunity to earn big money. No investment. We furnish everything. Don't wait, write today. State experience and present employment. Address Commercial Tailors, 838 W. Jackson Boul., Chicago.

HUGE profits selling Nibco Sanitary Brushes, Auto Washers, Brown Beauty Adjustable Floor Mops, Dustless Dusters, and other specialties. Big line. Fast sellers. Write today. Silver-Chamberlin Company, Department M, Clayton, New Jersey.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 163 Ninth, Washington, D. C.

ALSTON'S Marvel Cleanser; Cleans anything. Everybody buys. Agents wanted. Big profits. Send 25c now for pint concentration. H. E. Alston, 114 Dixwell Ave., New Haven, Conn.

BULL-DOG Inner Tires double tire mileage. Greatest seller and repeat order getter. Eliminates Blow-outs and 95% of Punctures. Agents making $5,000 to $10,000 a year. Exclusive territory. Write for particulars. Eastern Auto Specialty Co., Dept. A, Utica, N. Y.

SIGN Letter Agents and Painters; 500% Profit Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 431D N. Clark St., Chicago.

HERE'S a line you can sell! Big profits too! Fruit Drinks, Spices, Extracts, Toilet Articles, Vegetable Soaps, Remedies, Household Preparations. Over 125 products, all guaranteed. Branches at New York City, Memphis, San Francisco, Winnipeg and Hamilton give prompt shipping service, low freight rates. Ours is the oldest, largest and most successful agency house in the world. Particulars free. Write today. Dept. M.P.-2, The J. R. Watkins Company, Winona, Minn.

MOST Wonderful Seller. 96c profit every dollar. No stock to carry. License unnecessary. Sample free. Mission Bead Co., 1617 Irola, Los Angeles, Calif.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 25c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

AGENTS! Quick sales! Big profits! Orders in every home for our beautiful Dress Goods, Silks and General Yard Goods. Large book of samples free to agents. Write today for particulars. National Imp. & Mfg. Co., Dept. PD, 425 Broadway, New York.

AGENTS—Something different! Our Eradium (Luminous) Crucifix actually shines in the Dark. Startling! Mysterious! Wonderful enthusiasm follows every demonstration. 150% profit on every sale. Sole manufacturers. The Pioneer Corporation, 1259 W. 63d St., Chicago, Ill.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Company, 2 Daily Record, Baltimore, Md.

AGENTS—Large Manufacturer wants agents to sell hosiery, underwear, shirts, dresses, skirts, waists, shoes, clothing, etc. Write for free samples. Madison Mills, 503 Broadway, New York.

AGENTS—Advertising Pencils, ready sellers, excellent sideline. Write for proposition. North American Pencil Works, 501 Plymouth Court, Chicago.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission Bead Co., PM-2819, West Pico, Los Angeles.

AGENTS—Send for sample "Fretnot"—the washday wonder. Be convinced you can do a whirlwind business. You can clear at least $20 to $100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample, she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory guaranteed to agents who can produce. Credits given. Don't call. P. M. Motter & Sons, 20 E. Jackson Blvd., Chicago.

VULCANIZING auto-tires growing profitable business, especially now. Easy to learn. Instruction book $1. Plants $50 up. Catalog free. Equipment Company, 5 Canal St., Cincinnati, Ohio.

AGENTS and General Agents: Make traveling a profit instead of a loss. Go from town to town selling household necessities and securing new agents. Big income on your own and your agents' work. Write quick. Duo Co., Dept. B-1, Attica, N. Y.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrite Co., 1115 Second Ave., New York.

MAN to distribute samples, circulars, for "Foot Ointment," mail or hand; splendid opportunity. Write us today. Address The Elder Co., 294 Parkdale, Buffalo, New York.

"GALLAGHER made $336.00 one week selling guaranteed Collection Systems used by all business men." Sayers Mfg., 2815 Sheffield, Chicago.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejects credited. Prompt shipments. Send for latest catalogue and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

HIGH GRADE SALESMEN WANTED

SALESMEN are making big money with the Kendall Envelope Sealer. Carried in the vest pocket. Seals fifty envelopes a minute and one thousand without refilling. Retails $3.50. The best side line specialty invented. No matter what class of trade you call on they all have mail to get out and a demonstration means a sale. Write quick. Kendall Company, 79 Sudbury Street, Boston, Mass.

SALESMEN—Magazine, Wash Machine and Vacuum Cleaner who are willing to work out of town selling electrical appliances direct to the homes with opportunity to become district sales managers if qualified. If you are a hustler and willing to work we can assure you of a large income. A weekly drawing account for beginners. The Regina Company, 209 S. State St., Chicago.

BEST ink made. Washes freely from clothing. Indelible on paper. $20 daily easy. Beats competition. Acidproof Ink Co., Philadelphia, Pa.

SALESMEN: Represent factory direct as distributor, sell dealers, appoint agents. Nationally advertised Metal Specialties. Full line, exclusive contract. No investment. Smith & Stearns, 202 S. State St., Chicago.

DOLLAR specialty. Costs 25c. Universally needed. Many buy hundreds. Make $15 daily. 202 Pennsylvania Building, Philadelphia.

STEADY Income—Place Cartoon Advertising Cards. Big profits and weekly income. "Card-Toon," 1356 Carmen, Chicago.

EVERY man and boy a customer—Sell to dealers or direct. Big commission. Pocket sample, postpaid 50c worth $1.80. Guaranteed. Peerless Products Co., 4821 Lexington Ave., Cleveland, Ohio.

SALESMEN Wanted—Local or traveling, part or full time, to sell calendars, fans, fly swatters, brushes, rulers, etc. Over two hundred stock designs of paraffin signs, ice cards, etc., for all merchants. Fine side line, liberal commission. The Harrison Company, Union City, Ind.

SALESMEN—We are looking for an opportunity to manufacture a metal article which is in great demand. We will pay you well for this information if we can use it. Alto Mfg. Co., 4100 Lincoln Ave., Chicago.

FACTORY Representative: Having sold 150,000 of a household appliance in New England through local representatives, we wish District Managers to open other territory. Office work. Entire or side line. Territory assignments are paying upwards of $5,000 yearly. Reeves Company, 61 Broad St., Milford, Conn.

NEW 5-in-1 Interchangeable letter sign. Original Five Signs in One. Wording quickly changed with 500 time-saving, machine-cut characters. Salesmen's profit 100%. New England Sign Company, New Haven, Conn.

MAN with car, sell garage trade. Outfit furnished. Safety Equipment Co., Mentor, Ohio.

SALESMEN—Hustlers for nationally advertised auto accessories. Write immediately. Ludington, 1420 Central Ave., Cincinnati, O.

BULL-DOG Inner Tires double tire mileage. Greatest seller and repeat order getter. Eliminates Blow-outs and 95% of Punctures. Salesmen making $5,000 to $10,000 a year. Exclusive territory. Write for particulars. Eastern Auto Specialty Co., Dept. A, Utica, N. Y.

WERE You ever offered a Grocery Store? You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee and entire line of Groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hitchcock-Hill Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

$725.00 PER 100 Placing New Silk Shirt Salescards. Small investment; no selling. If you mean business, send $2.00 for $8.00 sample, with Particulars. Glass Novelty Co., Box 422, Alliance, Ohio.

WANTED side line men to sell the original Carryall Bag on commission. New reduced prices and prompt shipment make this a money maker for you. Address Carryall Sales Co., Walden, N. Y.

$40 TO $100 a week. Free Samples. Gold Sign Letters anyone can put on windows. Big demand. Liberal offer to general agents. Metallic Letter Co., 431C N. Clark, Chicago.

SALESMEN Wanted to sell Electric Cigar Lighters and Moisteners. Salary or commission. You carry stock or we ship direct. Write for special offer. Drake Mfg. Co., 221 Grand, Milwaukee, Wisc.

CALIFORNIA Rosebeads selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Bead Company, SP2819 West Pico, Los Angeles.

MEN, get into the wonderful tailoring agency business, big profits taking orders and your own clothes free. We furnish fine sample outfit and everything free. No experience needed. Write today. Banner Tailoring Co., Dept. 651, Chicago.

SALESMEN — Become independent—own your business, experience unnecessary—selling our $6,000 Accident, Death, $30.00 Accident, $25.00 Sick Weekly Benefits, $10.50 yearly, half amounts $5.50. Guaranteed steady income from renewals. $250,000 deposited Insurance Department. Registration Dept. P, Newark, N. J.

MEN Wanted to sell Groceries. Selling experience not necessary. One of the World's largest wholesale Grocery houses (capital over $1,000,000.00) wants ambitious men in your locality to sell direct to consumer nationally known brands of an extensive line of groceries, paints, roofings, lubricating oils, stock foods, etc. No capital required. Commissions advanced. Write today. State age and county desired. John Sexton & Co., 362 W. Illinois St., Chicago, Ill.

HELP WANTED

HUNDREDS Railway Mail Clerks, men and women over 17, wanted immediately by U. S. Government as Railway Mail Clerks. $1600 first year. Raise to $2300. Every second week off at full pay. Women selected for office work. Examinations everywhere every month. Sample questions free. Write immediately. Franklin Institute, Dept. D3, Rochester, N. Y.

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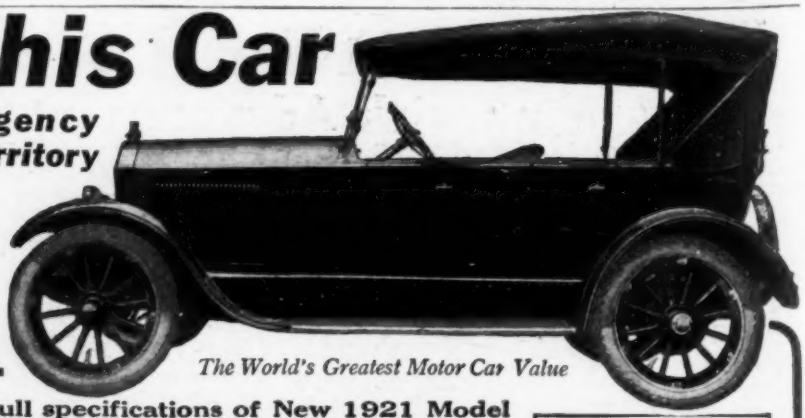

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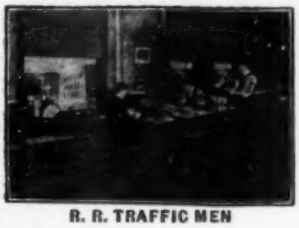

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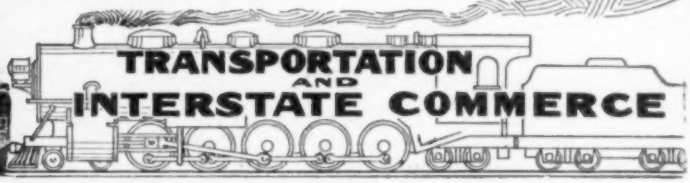

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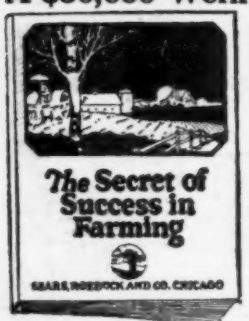

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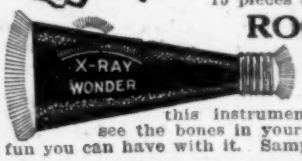

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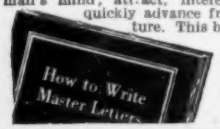

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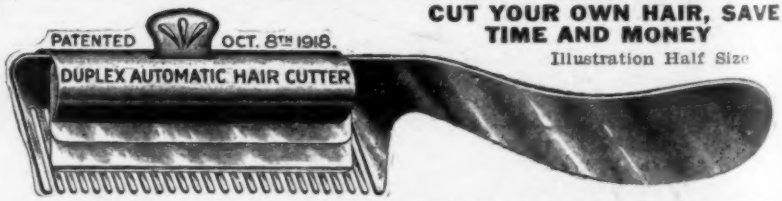

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Have you ever thrilled to the swing of a military march or cadence of a dance-piece? Have you ever felt the beauty of a sweet old-time tune? Have you ever longed to just sit down at the piano and *play*—anything—everything? If you feel the spell of music you have the "gift"—the spark that can become a flaming talent.

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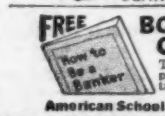

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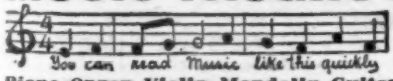

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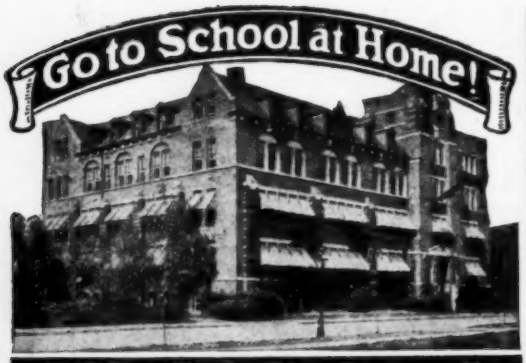

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How I Improved My Memory In One Evening

The Amazing Experience of Victor Jones

"Of *course* I place you! Mr. Addison Sims of Seattle.

"If I remember correctly—and I *do* remember correctly—Mr. Burroughs, the lumberman, introduced me to you at the luncheon of the Seattle Rotary Club three years ago in May. This is a pleasure indeed! I haven't laid eyes on you since that day. How is the grain business? And how did that amalgamation work out?"

The assurance of the speaker—in the crowded corridor of the hotel McAlpin—compelled me to turn and look at him, though I must say it is not my usual habit to "listen in" even in a hotel lobby.

"He is David M. Roth, the most famous memory expert in the United States," said my friend Kennedy, answering my question before I could get it out. "He will show you a bit more wonderful things than that, before the evening is over."

And he did.

As we went into the banquet room the toastmaster was introducing a long line of guests to Mr. Roth. I got in line and when it came my turn, Mr. Roth asked, "What are your initials, Mr. Jones, and your business connection and telephone number?" Why he asked this I learned later, when he picked out from the crowd the 60 men he had met two hours before and called each by name without a mistake. What is more, he named each man's business and telephone number, for good measure.

I won't tell you all the other amazing things this man did except to tell how he called back, without a minute's hesitation, long lists of numbers, bank clearings, prices, lot numbers, parcel post rates and anything else the guests had given him in rapid order.

* * * * * *

When I met Mr. Roth again—which you may be sure I did the first chance I got—he rather bowled me over by saying, in his quiet, modest way:

"There is nothing miraculous about my remembering anything I want to remember, whether it be names, faces, figures, facts or something I have read in a magazine.

"You can do this just as easily as I do. Anyone with an average mind can learn quickly to do exactly the same things which seem so miraculous when I do them.

"My own memory," continued Mr. Roth, "was originally very faulty. Yes it was—a really *poor* memory. On meeting a man I would lose his name in thirty seconds, while now there are probably 10,000 men and women in the United States, many of whom I have met but once, whose names I can tell instantly on meeting them."

"That is all right for you, Mr. Roth." I interrupted, "you have given years to it. But how about me?"

"Mr. Jones," he replied, "I can teach you the secret of a good memory in one evening. This is not a guess, because I have done it with thousands of pupils. In the first of seven simple lessons which I have prepared for home study, I show you the basic principle of my whole system and you will find it—not hard work as you might fear—but just like playing a fascinating game. I will prove it to you."

He didn't have to prove it. His Course did; I got it the very next day from his publishers, the Independent Corporation.

When I tackled the first lesson, I suppose I was the most surprised man in forty-eight states to find that I had learned—in about one hour—how to remember a list of one hundred words so that I could call them off forward and back without a single mistake.

That first lesson *stuck*. And so did the other six.

Read this letter from Terence J. McManus, of the firm of Olcott, Bonynge, McManus & Ernst, Attorneys and Counsellors at Law, 170 Broadway, and one of the most famous trial lawyers in New York:

"May I take occasion to state that I regard your service in giving this system to the world as a public benefaction. The wonderful simplicity of the method, and the ease with which its principles may be acquired, especially appeal to me. I may add that I already had occasion to test the effectiveness of the first two lessons in the preparation for trial of an important action in which I am about to engage."

Mr. McManus didn't put it a bit too strong. The Roth Course is priceless! I can absolutely *count* on my memory now. I can tell the name of most any man I have met before—and I am getting better all the time. I can remember any figures I wish to remember. Telephone numbers come to mind instantly, once I have filed them by Mr. Roth's easy method. Street addresses are just as easy.

The old fear of forgetting (you know what that is) has vanished. I used to be "scared stiff" on my feet—because I wasn't *sure*. I couldn't remember what I wanted to say.

Now I am sure of myself, and confident and "easy as an old shoe" when I get on my feet at the club, or at a banquet, or in a business meeting, or in any social gathering.

Perhaps the most enjoyable part of it all is that I have become a good conversationalist—and I used to be as silent as a sphinx when I got into a crowd of people who knew things.

Now I can call up like a flash of lightning most any fact I want right at the instant I need it most. I used to think a "hair trigger" memory belonged only to the prodigy and genius. Now I see that every man of us has that kind of a memory if he only knows how to make it work right.

I tell you it is a wonderful thing, after groping around in the dark for so many years to be able to switch the big search-light on your mind and see instantly everything you want to remember.

This Roth Course will do wonders in your office.

Since we took it up you never hear anyone in *our* office say "I guess" or "I think it was about so much" or "I forget that right now" or "I can't remember" or "I must look up his name." Now they are right there with the answer—like a shot.

Have you ever heard of "Multigraph" Smith? Real name H. Q. Smith, of the John E. Price Co., Seattle, Wash. Here is just a bit from a letter of his that I saw last week.

"Here is the whole thing in a nutshell: Mr. Roth has a most remarkable Memory Course. It is simple, and easy as falling off a log. Yet with one hour a day of practice anyone—I don't care who he is—can improve his Memory 100% in a week and 1,000% in six months."

My advice to you is don't wait another minute. Send to Independent Corporation for Mr. Roth's amazing course and see what a wonderful memory you have got. Your dividends in *increased earning power* will be enormous.

VICTOR JONES.

Send No Money

So confident is the Independent Corporation, the publishers of the Roth Memory Course, that once you have an opportunity to see in your own home how easy it is to double, yes, triple your memory power in a few short hours, that they are willing to send the course on free examination.

Don't send any money. Merely mail the coupon or write a letter and the complete course will be sent, all charges prepaid, at once. If you are not entirely satisfied send it back any time within five days after you receive it and you will owe nothing.

On the other hand, if you are as pleased as are the thousands of other men and women who have used the course, send only $5 in full payment. You take no risk and you have everything to gain, so mail the coupon now before this remarkable offer is withdrawn. **Independent Corporation, Dept. R-4512, 319 Sixth Ave., New York.**

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You may send me the Course or Courses checked below. Within five days after receipt I will either remail them or send you $5 for each in full payment, except as noted.

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[]Drawing, Art, Cartooning Course ($5) By Charles Lederer

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[]Mastery of Speech ($5) By Frederick Houk Law

[]Super-Salesmanship ($5) By Arthur Newcomb

[]Practical Course in Personal Efficiency ($5) By Edward E. Purinton

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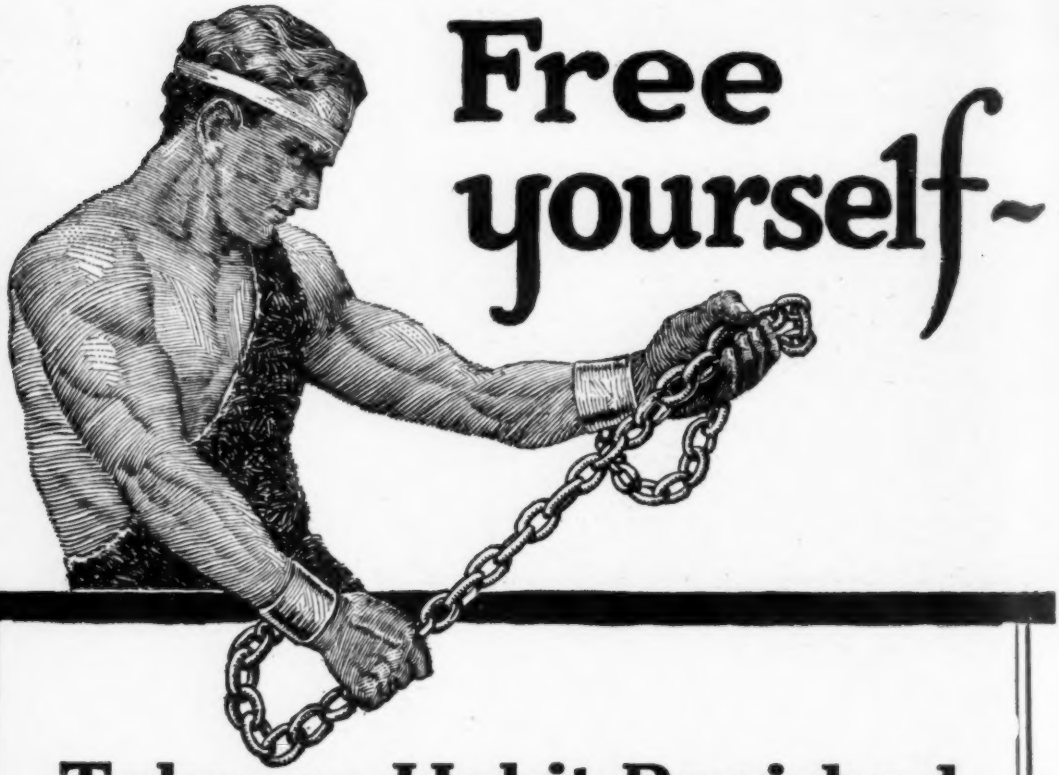

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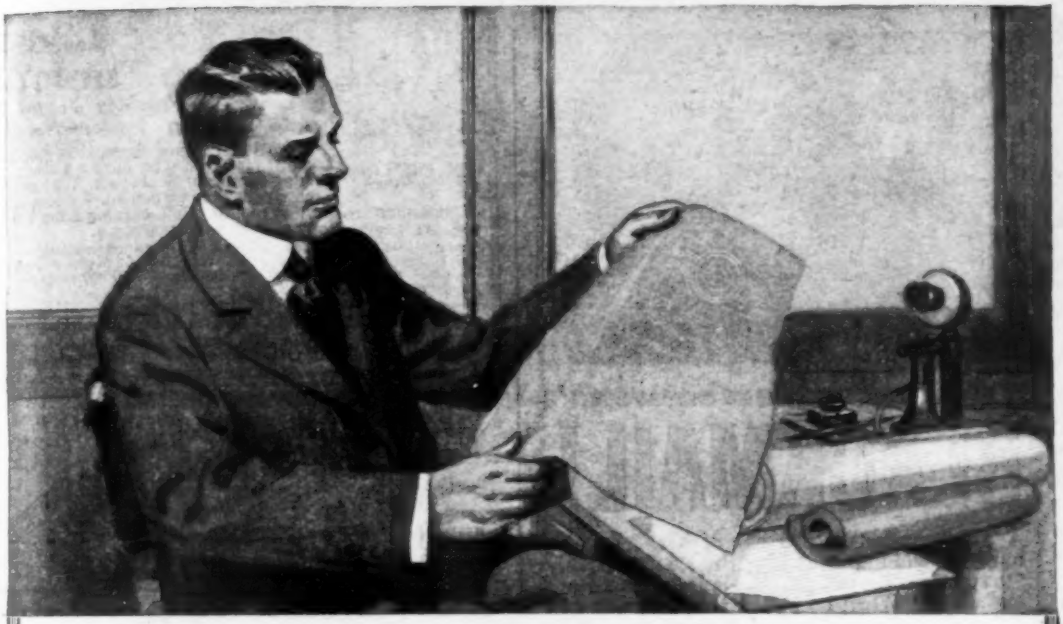

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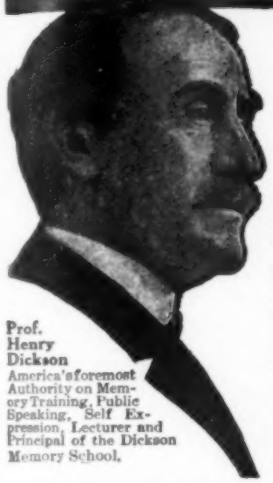

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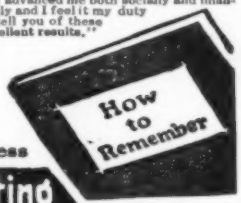

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- ☐ Marine Engineer
- ☐ Ship Draftsman
- ☐ ARCHITECT
- ☐ Contractor and Builder
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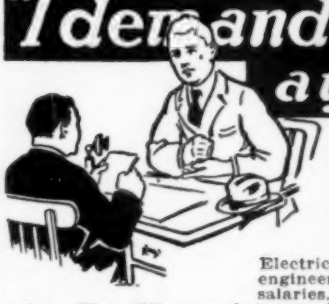

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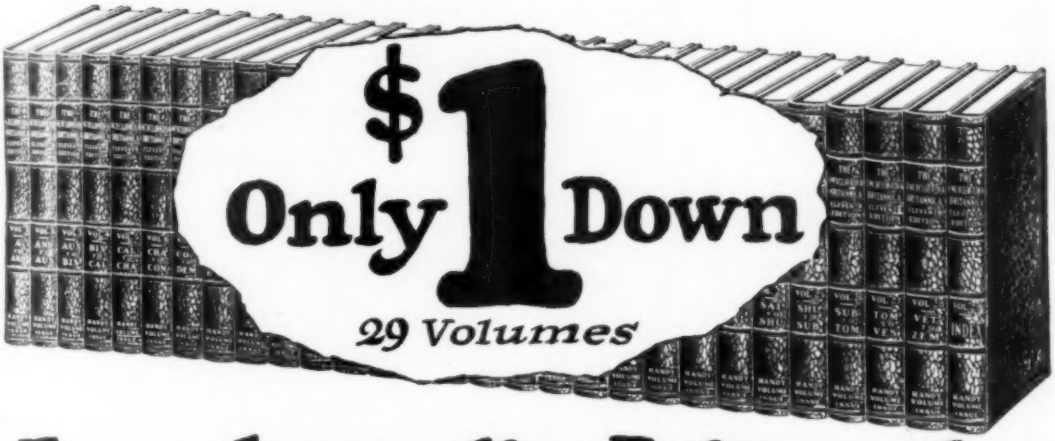

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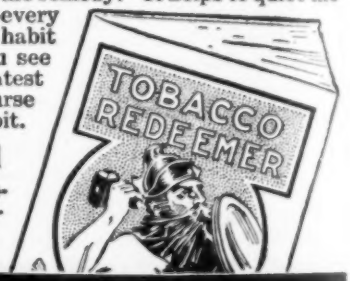

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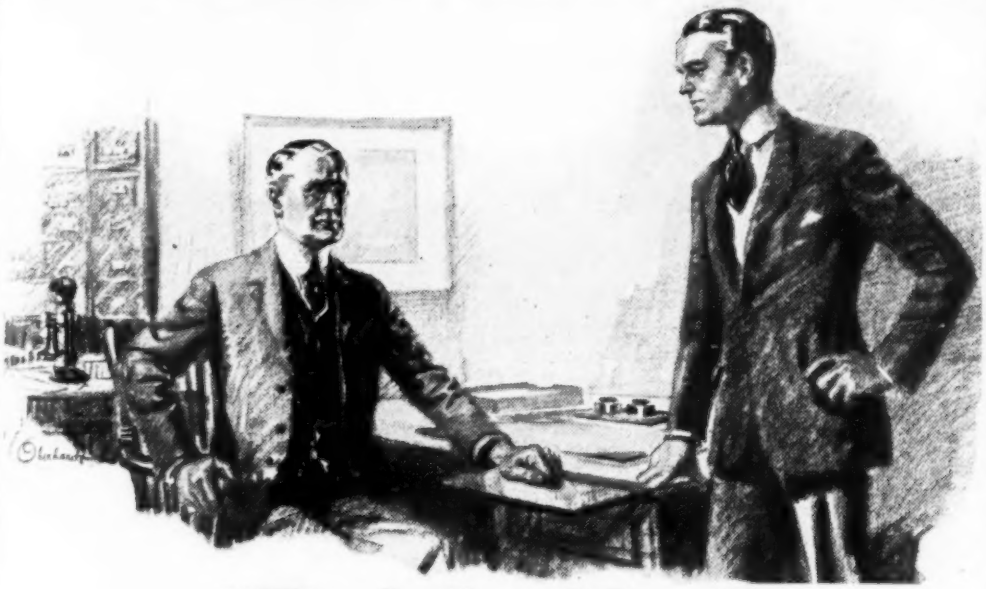

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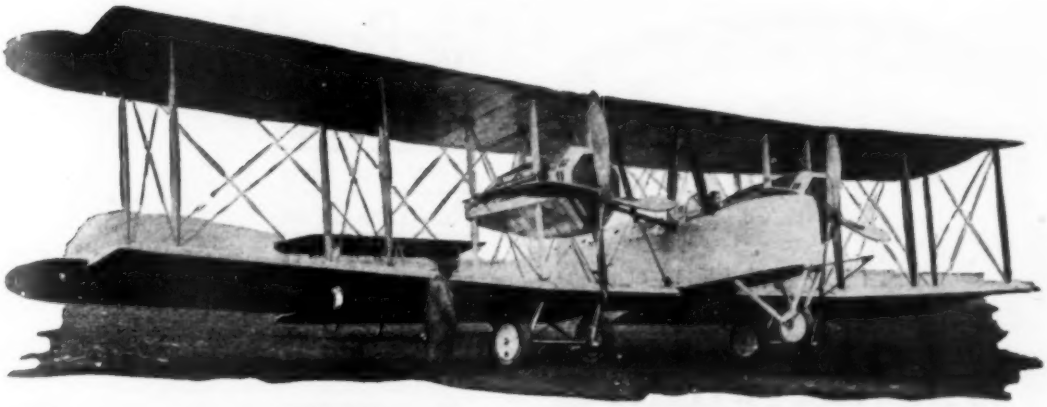

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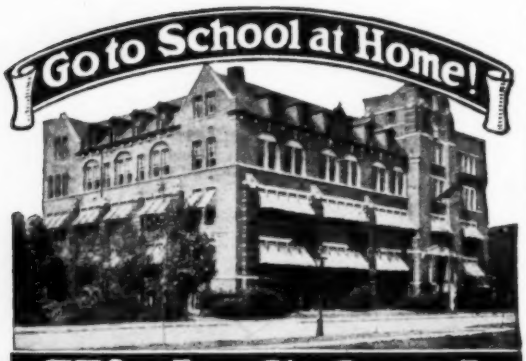

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Would Peter Minuit have secured Manhattan Island for $24 if the Indians had spoken Dutch?

Manhattan, today, has an assessed valuation of $5,186,771,887.00. In 1626, sixty guilders worth of glass beads and trinkets for one of their summer hunting grounds seemed princely to the Indians. They did not understand the Dutch or English language and so missed the trader's vision of future realty values.

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European markets are still bare and the sources of their supplies still inadequate. Europe seeks food, manufactured articles, man-power—and insatiably demands raw materials.

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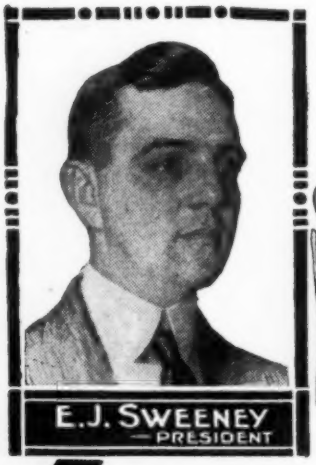

2 horse 60 horse

Every young man who owns a farm or works on a farm should study these pictures.

WILL YOU be a two-horse power man at $3 a day or a 60 horse power man at $15 a day? I am training thousands of young men to run farm machinery and earn big money and easy money instead of sweating in a furrow. Do you know that 8 weeks at the Million Dollar Sweeney School-Auto tractor and aviation, is all that stands between you and the **Job you really want?**

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I teach men to fix machinery, make and repair and drive automobiles, tractors, gas-engines, etc., to make and repair tires—in general, to become first class, expert mechanics. I teach this in 8 weeks by the Sweeney System of Practical Experience—which means that you learn by tools, not books, you learn by doing things with your own hands. So simple, that a deaf and dumb man, Joel Piatt, learned in 8 weeks; so perfect that it was approved by the United States Government in sending me 5,000 men to train for army mechanics, and still further proved by the wonderful success made by many thousands of our men, as evidenced by countless letters which I can show you.

$20 A DAY

Hutchinson, Kan., Aug. 16, 1920.

I thought I would write to let you know one of your students is still going good. I got $1.25 per hour repairing since I left there in April up to July, and after that I have been running a tractor for Tom Withroder and Joe Stucky at Sylvia, Kans., for $20 a day. This is the most money ever paid for an engineer in Kansas, so you know how I feel about it.

I sure tell it to them and when they see me sit in the shade and draw $20 a day they all get the Sweeney fever.

W. B. JONES.

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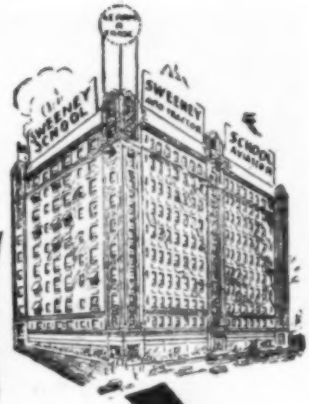

The whole question is:

Are You Mechanically Inclined?

If you are I can fit you in a few short weeks to hold the job you really want.

Wall Street says the automobile business has all the money in the country. It's the industrial giant of the world. Eight million automobiles—**millions of dollars' worth of tires, hundreds of thousands of tractors**—garages—equipment shops—flying fields, mechanics—engineers—salesmen—demonstrators—repairmen—the demand is simply beyond calculation.

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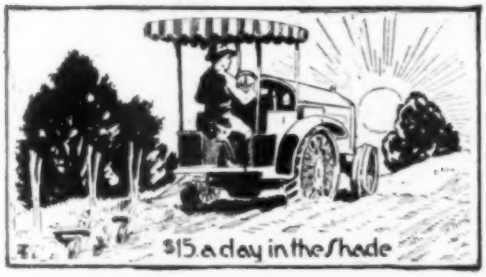

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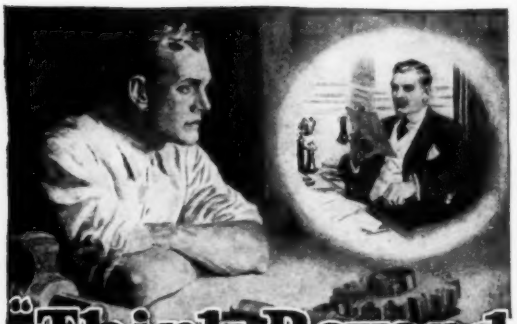

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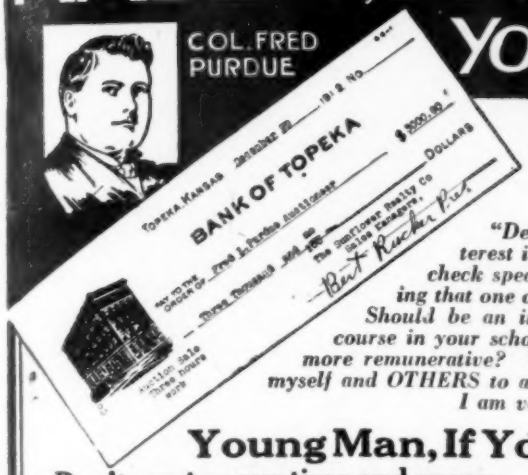

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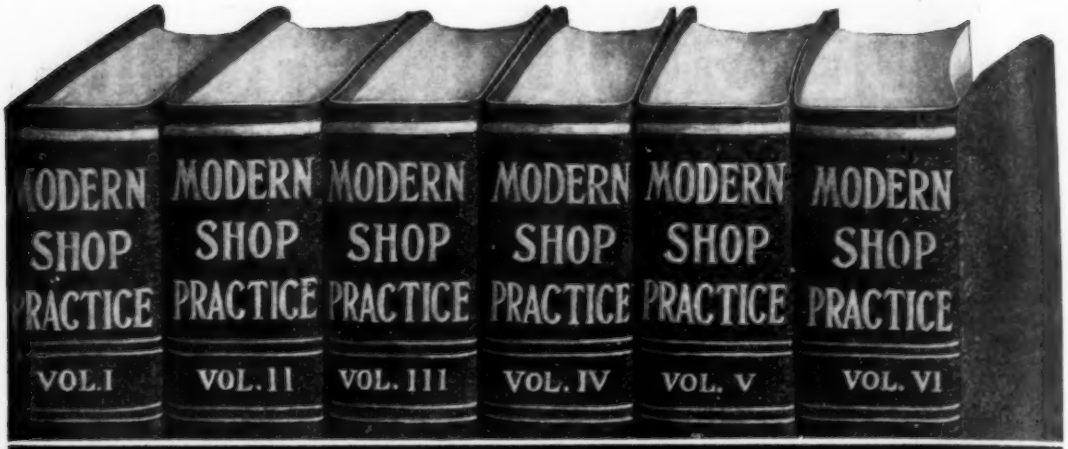

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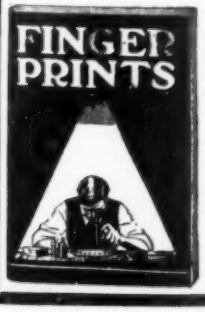

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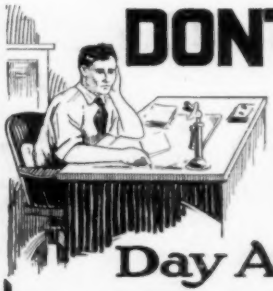

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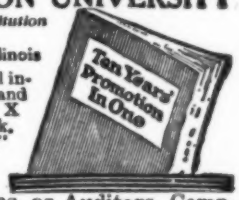

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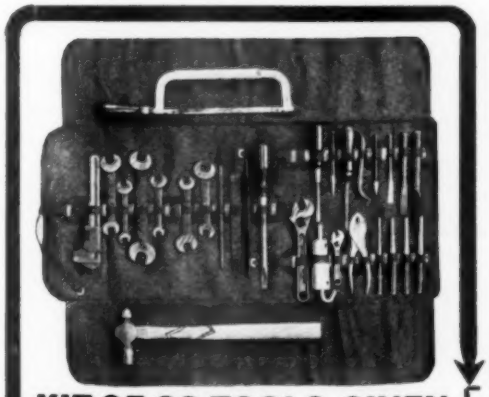

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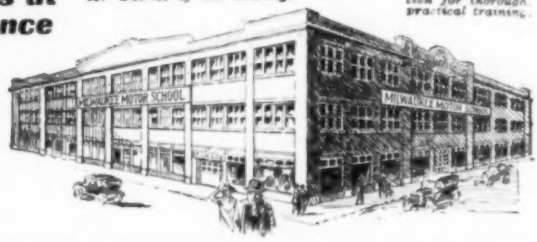

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Maybe you think you CAN'T write when you really CAN. Thousands of people of ordinary education who "didn't think they could," now write stories and photoplays in their spare time! Why not YOU! By the New Irving System men and women everywhere are finding out it's as easy to learn story writing as it is arithmetic or grammar! And all these people formerly thought they had to be literary geniuses in order to WRITE!

Lots of those thrilling movie plays you see—endless magazine stories you've read—were written by people LIKE YOURSELF, who took up writing simply because they liked it and *wanted to see if they could do it.*

Why not find out if you, too, can write?

How do you know you really can't?

Maybe with the New Irving System you would surprise yourself, your family and friends!

Wouldn't you like suddenly to develop a fine, new talent like this?

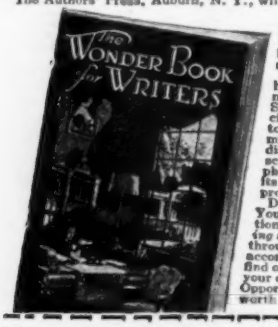
It is so fascinating! It gratifies, it enthuses, it thrills you! It makes you happy—it elevates you. You learn to move people to laughter or tears—to "paint pictures in their minds"—to deeply interest them—and your story or photoplay has as much chance of greatness as those of any other author. Why not? It has happened before—time and time again. Sometimes the simplest stories catch the popular fancy. Often the unknown author springs to fame overnight. Out of the crowd—out of the unknown—have come our famous authors and playwrights.

You can study story and play writing after your working hours, or even in the street car going to and from your work. Think! *Instead of wasting that time in your trips back and forth you can be learning something wonderful*—something that may mean a New Future for you! Join the ambitious ones who no longer waste their spare hours. And don't hesitate because you have an ordinary education—that may be a HELP instead of a hindrance. Brilliant people have really done less in writing than the plainer, persistent ones who had common sense and determination.

The Authors' Press, of Auburn, N. Y., is helping people succeed as writers—people of small means and modest occupations who thought it impossible for them to write at all—who now sell their stories and plays to magazine and scenario editors.

Since the advent of the movie, the science of story writing has made big strides. *You owe it to yourself to find out all about this.* Through this New System you are readily taught the correct way to write a story or play.

The Authors' Press, Auburn, N. Y., will send you, absolutely free, a beautifully illustrated book you will be grateful for—a book for people who don't know whether or not they can write. It is filled with helpful suggestions for everyone seeking self-advancement.



This book is something you may have long looked for—it explains many things about Writing Plays and Stories: how to begin; how to find incidents and people to write about; how to originate plots; how to weave romantic situations; how to construct dialogue; how to perfect your manuscript; how to submit it to magazine and photoplay companies. This book, with its many interesting illustrations, will prove a revelation to you in many ways.

Don't hesitate. Send for it. No charge. You are not under the slightest obligation. You have as much chance of *learning something new* as anybody else—and through this simple new system you may accomplish wonders! It doesn't hurt to find out, anyway. The coupon below is for your convenience—it opens a New Door to Opportunity—it paves the way to something worth while. USE IT.

THE AUTHORS' PRESS, Dept. 140, Auburn, N. Y.

I would like to have a copy of your free descriptive illustrated booklet for those aspiring to write. This does not obligate me in any way

Name .....

Street .....

City and State .....

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BE AN AUTOMOTIVE EXPERT!

EXPERT Automobile and Tractor Mechanics are in demand everywhere. Well trained men earn big money. YOU can qualify for these positions. We teach you by daily actual practice under skilled instructors. Experience in training thousands of mechanics for U. S. Government. Course include all branches of automobiles, tractors, welding and tire vulcanizing. Day or evening classes. Our free catalog tells how we train men to occupy expert automotive positions. Send for your copy now.

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What a Dime Will bring You From the Nation's Capital

The little matter of **10 cts.** will bring you the Pathfinder **eight** weeks on trial. The Pathfinder is an illustrated weekly, published at the Nation's center, for all the Nation; an independent home paper that prints all the news of the world and tells the truth; now in its 28th year. This paper fills the bill without emptying the purse; it costs but $1 a year. If you want to keep posted on what is going on in the world, at the least expense of time or money, this is your means. If you want a paper in your home which is sincere, reliable, entertaining, wholesome, the Pathfinder is yours. If you would appreciate a paper which puts everything clearly, strongly, briefly—here it is. Send 10c to show that you might like such a paper, and we will send the Pathfinder on probation eight weeks. The 10c does not repay us, but we are glad to invest in new friends. **The Pathfinder, 475 Langdon Sta., Washington, D. C.**

Washington has become the World's Capital and reading the Pathfinder is like sitting in the inner council with those who mold the world's destiny.

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Send No Money Write today. Shirts will be sent at once, transportation prepaid. Pay only $3.69 on arrival—no more. Money back at once if not more than pleased with the wonderful value. Be sure to give neck-band size.

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Sky-high Salaries in Aviation—Men wanted

Learn a line of business that is up and coming. Master a trade that commands respect—and important money! Practical knowledge of aviation makes $1,000 a month something more than a dream! For your own sake, do not doubt this, nor our ability to teach you—by mail.

Plenty of Opportunities Now, and for Years to Come

Commercial aviation has arrived. Seven big plane manufacturers are begging for men who know something—anything—about aeronautical engines, plane construction, assembling, inspecting, flying. In the air, or on the ground—field or shop—permanent places await you.

Big pay comes through wise selection of occupation. No amount of skill on a bread-and-butter job can make the money handed even the average aviation worker. And aviation work is so fascinating, you'll wish working hours were not so short!

It IS NOT Hard to Learn

By Mail—At Home—In Spare Time

The fact that aviation wages are up around $60 and $75 weekly for mere beginners, does not mean that this line is extra hard to learn. It's scarcity of men that keeps the pay so high. The business has grown too fast for most men to realize. And mechanics who would make star men on airplane work have passed it up under the impression it must be extremely difficult to learn. It isn't. Not as we teach it. The first lesson will prove this.

Fast Air Lines are being organized all over the country. The U. S. mails between large cities; corporations requiring quick deliveries between plants; passenger lines; freight service under way. Aviation is where the automobile industry was a few years ago.

For Quick Action and the swiftest, most certain money reward to be had, get into aviation. But get in now. Before 1920 is over, you can learn—and be earning. You can finish the year with more money laid by than a humdrum occupation will pay you all told. There's a coupon below.

Actual photograph showing one of the many "Liners of the Air" for which pilots to fly, and experts to build are sought — with hardly any limit as to pay!

Expert Instructors

Every Step of the Way

From Captain George F. Campbell, chief National instructor, down—National experts are the best known, best equipped men in their line. You learn at home—all by mail. Under National guidance, you will learn right. The airplane interests prove this by their preference for men who are National trained.

FREE Inside facts—a book that explains everything—and a personal reply to your inquiry will cost nothing. If you decide to enroll, the whole cost of instruction is trivial compared with the money you can draw within a few months—a few weeks if you'll work. Get this FREE book. Get the facts. Here is the coupon ☞

National Aero Institute, Dept. 119Z, 916 S. Michigan Ave. CHICAGO, ILL.

NATIONAL AERO INSTITUTE,
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Chicago, Ill.

Please send me absolutely free and prepaid your book on the Science of Aviation, and full particulars of your mail course in the principles of aviation.

Name .....

Address .....

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The Hour That Counts!

When you see a man putting in his noon hour learning more about his work, you see a man who won't stay down. He'll never be satisfied until he hits the top. And he'll get there!

In shops, factories, offices, stores, in every line of industry, men are holding splendid positions won through spare time study with the International Correspondence Schools. Today they are earning four or five times—yes, some of them *ten* times as much money as when they started.

Employers everywhere are looking for men who really want to get ahead. If *you* want to make more money, show your employer that you're trying to be *worth* more money.

For 30 years the International Correspondence Schools have been training men and women right in their own homes.

More than two million have stepped up in just this way. More than 130,000 are studying now. Can you afford to let another hour pass without making *your* start toward something better? Here is all we ask—without cost, without obligation, mark and mail this coupon!

TEAR OUT HERE

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 5693-B, SCRANTON, PA.

Explain, without obligating me, how I can qualify for the position, or in the subject, *before* which I mark X.

- ☐ ELECTRICAL ENGINEER
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- ☐ Telegraph Engineer
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- ☐ Gas Engine Operating
- ☐ CIVIL ENGINEER
- ☐ Surveying and Mapping
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- ☐ STATIONARY ENGINEER
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- ☐ Ship Draftsman
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- ☐ Architectural Draftsman
- ☐ Concrete Builder
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- ☐ BOOKKEEPER
- ☐ Stenographer and Typist
- ☐ Cert. Public Accountant
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- ☐ Railway Mail Clerk
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- ☐ Auto Repairing
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Name_____
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Canadians may send this coupon to International Correspondence Schools, Montreal, Canada 7-25-19

A Complete Home Gymnasium

With a Whitely Exerciser you can get the joy and thrill that goes with out-of-door sports. The stroke of the oarsman, the sprightly manipulation of a tennis racquet, the long sweep of the bowling alley, the swish of a baseball bat—in fact, those delightful exercises that a sedentary occupation limit or deny are made possible by the use of a **Whitely Exerciser**

It quickly strengthens the heart action, aids digestion, develops strong muscles, and improves the health. For rounding out the form to more graceful curves and more artistic proportions women will find the Whitely of exceptional value.

Its strong, flexible, finely-fibered elastic cords resemble the human muscle in many ways. All the champions have used the Whitely in training. Sold by sporting goods and hardware stores, also general stores. If your dealer does not have the Whitely, send us $5.00 and we will ship, prepaid, one fully guaranteed elastic cord Whitely Exerciser, including a copy of Dr. W. G. Anderson's famous book "Physical Education"; or $4.00 for the best grade Whitely Safety Spring Exerciser with complete chart of movements. Order today. We will send this outfit on FIVE DAYS' TRIAL, returning your money if you are not satisfied.

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36 Vesey Street, New York City
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Photography, Photo-Engraving and Three-Color Work

Our graduates earn $35 to $100 a week. We assist them to secure these positions. Now is the time to fit yourself for an advanced position at better pay. Terms easy; living inexpensive. Largest and best school of its kind. Write for catalog *today.*

ILLINOIS COLLEGE OF PHOTOGRAPHY
Box P, 999 Wabash Ave. Effingham, Illinois

Become an ARTIST

The profits of this fascinating work are here convincingly told by Federal Students

Take the Road to Sure Success

The stories of Federal Students who **have prepared themselves** to win success, are convincing evidence of the splendid opportunities open today to **well-trained** commercial artists.

The letters which follow are but a sample of many hundreds in our files. They give you the experience of Federal Students in their own words—and also what leading illustrators, designers and art employers think of the Federal home-study Course in Commercial Designing:

A $3,000 Salary—"Opportunities Unlimited"

"A few years ago I was living in a small town in Illinois, a telegraph operator with little opportunity for advancement. Today I am on the art staff of one of the largest illustrating concerns in America, **receiving a salary of $3,000 a** year, engaged in a work that is intensely fascinating, and where the opportunities are practically unlimited."—B. C. Robertson, Minneapolis, Minn.

Salary Increased 75% in 8 Months' Time

"I can't begin to tell you how much good the course has done for me so far. My work has improved vastly and I'm getting more outside work than I can handle. The course, **being thoroughly practical**, has commercialized my view-point so that my "lay-outs" are really pulling. Incidentally, **my salary has increased 75% in 8 months' time.**"—Lester H. Wertheimer, Pittsburgh, Pa.

"My Work Worth $100 per Week"

"My work went over big with the ——— Motor Car Co., but they said they only had enough work to make it worth $3,500 per year to them. I was told in Detroit that my work was easily worth $100 per week. Your lesson on color I think is wonderful, and easily worth the price of the course itself. The Federal Course has taken me from the ordinary to the better class in **considerably less time than I could have done it by myself.**"—C. P. Maltman, Columbus, Ohio.

$300 to $400 in Spare Time

"The Federal Course is the most **complete, practical and thorough** of anything of its kind, and I have tried three different art courses by correspondence. While I have not completed the course I have received sufficient instructions to sell between $300 and $400 worth of drawings, and this is **all** done in spare time."—H. V. Cline, Cherokee, Iowa.

"I Average $50 to $60 a Week"

"I have my own studio and have specialized in fashion and feature drawing. Magazine illustrations and covers are my next goal, but in the meantime the **$50 or $60 a week I average** comes in very handy in preparing for future training."—F. Louise Klapp, Minneapolis, Minn.

What Leading Designers and Art Studios Say of the Federal Course

"Please accept from me my appreciation of what your School is doing. I have in my art department three men who are students of your course. They are very efficient, and seem to display an individuality in their work which is often lacking in the student as turned out by the art schools generally. Their work is also practical. I have recommended your course to various young people, and always tell them that with any co-operation on their part I cannot see how your course can fail."—Alex. O. Levy, Art Director, Larkin Co., Buffalo, N. Y.

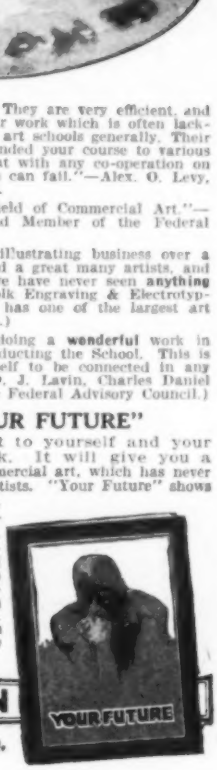
"The Federal Course covers well the field of Commercial Art."—Franklin Booth, Noted Illustrator, and Member of the Federal Advisory Council.

"We have been in the engraving and illustrating business over a quarter of a century, and have employed a great many artists, and visited a great many art schools, but we have never seen **anything** so **practical** as your art course."—Suffolk Engraving & Electrotyping Co., Boston, Mass. (This concern has one of the largest art departments in the New England States.)

"The Federal School Management is doing a **wonderful** work in the thorough manner in which it is conducting the School. This is the **first** time that I have allowed myself to be connected in any way with a correspondence school."—D. J. Lavin, Charles Daniel Frey Co., Chicago, Ill. (Member of the Federal Advisory Council.)

Send Today for "YOUR FUTURE"

If you like to draw, you owe it to yourself and your future success to read this book. It will give you a true vision of the splendid field of commercial art, which has never been able to get enough **well-trained** artists. "Your Future" shows remarkable work by Federal Students, both men and women, tells of their successes, explains the course in detail, gives endorsements by many more leading illustrators and designers, and shows how you can learn at home in your spare time, under a plan **that absolutely insures your satisfaction.** You cannot afford to be without this book. Send for it **today**, enclosing 6c in stamps, and kindly stating your age and occupation.



USE THIS COUPON

Federal School of Commercial Designing,
659 Federal Schools Bldg.,
Minneapolis, Minn.

Gentlemen: Please send me "Your Future," without obligation to me, 6c in stamps enclosed.

Name.....

Age.....Occupation.....

(Write your address plainly in margin.)

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Do you want an important, high-salaried position? You can have one if you can do the work. LaSalle experts will show you how, guide you step by step to success and help solve your personal business problems. Our plan enables you to train during spare hours without interference with your present duties. Give us your name and address and mark with an "X" below the kind of position you want to fill. We will mail catalog and full particulars regarding our low cost monthly payment plan. Also our valuable book for ambitious men, "Ten Years' Promotion In One". Tear out and mail this advertisement today. No obligation to you. Let us prove to you how this step has helped thousands of ambitious men to real success.

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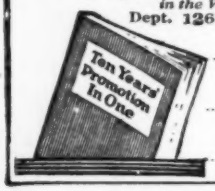


[Name]

[Present Position]

[Address]

Please Mention Popular Mechanics

No More Wrinkles
BEAUTIFUL FIGURE
Superfluous Hair Vanishes Like Magic. Eyelashes Beautified
Pimples and Blackheads Removed

Let this woman send you free everything she agrees. Beautify your face and form quickly.

This clever woman has not a wrinkle upon her face; she has perfected a marvelous, simple method which brought a wonderful change in her face. For removing wrinkles her method is truly wonderfully rapid.

She made herself the woman she is today and brought about the wonderful change in her appearance in a pleasant manner. Her complexion is as clear and fair as that of a child. She turned her scrawny figure into a well developed form. She had thin, scrawny eyelashes and eyebrows, which could scarcely be seen, and she made them long, thick and beautiful by her own methods and removed every blackhead and pimple from her face.

Nothing is taken into the stomach, no common massage, no harmful plasters, no worthless creams.

By her new process, she removes wrinkles and develops the whole figure plump and fat.

It is simply astonishing the hundreds of women who write in regarding the wonderful results from this new beauty treatment, which is beautifying their face and form after beauty doctors and other methods failed. She has thousands of letters on file like the following:

Mrs. M. L. B. Albin, Miss., writes: "I have used your beauty treatment with wonderful success. I have **not a wrinkle on my face** now and it is also improving my complexion which has always troubled me with pimples and blackheads. My weight was 112 pounds before taking your treatment and now I weigh 117, a gain of 5 pounds. Your treatment **is a Godsend** to all thin women. I am so grateful you may even use my letter if you wish."

The valuable new **beauty book** which Madame Clare is sending free to thousands of women is certainly a blessing to women.

Write her at once and she will tell you absolutely free, about her various new beauty treatments and will show:

How to remove wrinkles in 8 hours;
How to develop the figure;
How to make long, thick eyelashes and eyebrows;
How to remove superfluous hair;
How to remove blackheads, pimples and freckles;
How to remove dark circles under the eyes;
How to quickly remove double chin;
How to build up sunken cheeks and add flesh to the body;
How to darken gray hair and stop hair falling;
How to stop perspiration odor.

Simply address your letter to Helen Clare, Suite A509, 3311 Michigan Ave., Chicago, Ill., and don't send any money, because particulars are free, as this charming woman is doing her utmost to benefit girls or women in need of information which will add to their beauty and make life sweeter and lovelier in every way.

Big Money

Made by agents selling our wonderful Facial Soap, Perfumes, Toilet Articles, Spices, Extracts, etc. Free cake of soap and agents' terms mailed to any address.

LACASSIAN CO. Dept. 455 ST. LOUIS, MO.

YOU Can Earn—
—a Garage Like This
—it's Worth $50,000.

Al Smith earned it with no capital to start with. He learned auto mechanics the *Hogan Way.* With no other capital than his knowledge gained in an 8 weeks Hogan course, he started into the garage business in Kansas City. Now he has this fine well equipped garage at 46th and Troost, worth $50,000—and it's all his too. He has made good. Hogan graduates do.

You, Too, Can Be a Motor Expert
and Earn $100 to $600 a Month

You get *individual instruction* at the Hogan School. That's why you can become an expert auto and tractor mechanic in 6 to 8 weeks.

You get thorough explanation and *practical experience* with tools on modern autos and tractors.

You get the benefit of the time-tried *Hogan Method* proved to be right by thousands of successful graduates—a method that was good when it started and has grown better every year from the experience of 20 years as an auto mechanic (since 1900), 12 years directing the auto school (since 1908), and 9 years flying (since 1911).

You get the benefit of the experience of the army mechanical and aviation schools and army air service testing stations.

HOGAN Aviation, Auto and Tractor School
"The School of Personal Instruction"

You get the benefit of ***Ample Equipment*** and ***Individual Instruction*** from unusually competent instructors.

Hogan Graduates have the training for success—they succeed. So can you. Hogan graduates earn from $100 to $500 a month and more. So can you Farmer graduates save repair bills and make their tractors and equipment last longer. So can you.

Write today for full information—it's ***FREE.*** Prepare yourself to be the kind of success Al Smith is. Prepare yourself to earn big money in the most rapidly growing industry of the day. You can do it. You owe it to yourself.

MR. CLIFF HOGAN
55 Hogan Bldg., Kansas City, - Mo.

Send me FREE, full information about your success producing motor course.

Age.....

Name.....

Town..... State.....

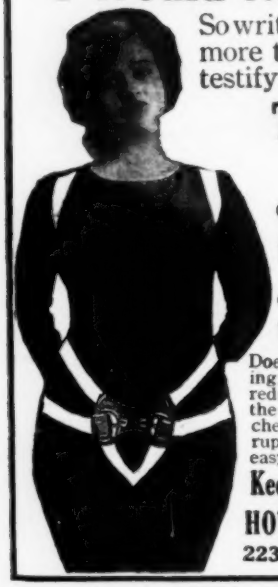
Street..... R.F.D.....

MAIL THIS COUPON TODAY →

SAVE YOUR BODY

Conserve Your Health and Efficiency First

"I Would Not Part with it for $10,000"



So writes an enthusiastic, grateful customer. "Worth more than a farm," says another. In like manner testify over 100,000 people who have worn it.

The Natural Body Brace

Overcomes **WEAKNESS** and **ORGANIC AILMENTS** of **WOMEN AND MEN.** Develops **erect,** graceful figure.

Brings restful relief, comfort, ability to do things, health and strength.

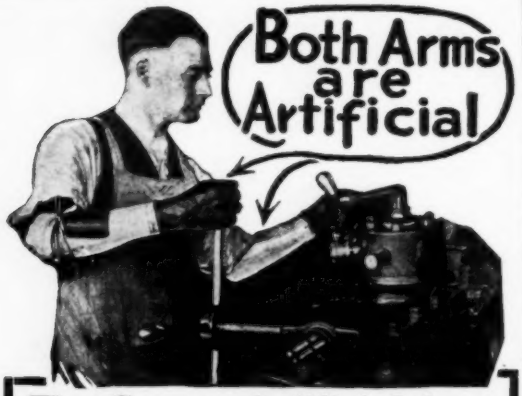
Wear It 30 Days Free at Our Expense

Does away with the strain and pain of standing and walking; replaces and supports misplaced internal organs; reduces enlarged abdomen; straightens and strengthens the back; corrects stooping shoulders; develops lungs, chest and bust; relieves backache, curvatures, nervousness ruptures, constipation, after effects of flu. Comfortable and easy to wear.

Keep Yourself Fit Write today for illustrated booklet, measurement blank, etc., and read our very liberal proposition.

HOWARD C. RASH, Pres. Natural Body Brace Co.
223 Rash Building **SALINA, KANSAS**

For Boys and Girls Also



The Carnes Artificial Arm

has enabled Edward Finnegan, 413 Olive St., Kansas City, Mo., to continue his work as a skilled mechanic, altho he has lost both arms. His earning power is the same, his efficiency practically as high. To see him work or on the street, you would never think that both arms were artificial. This is because the Carnes Artificial Arms which he wears are inconspicuous, natural in appearance, strong and serviceable.

The Carnes Arm is totally unlike any other. It is the only arm that is practical and useful, and at the same time does not proclaim itself as being artificial. Its wearers are able to continue their ordinary occupations, wait on and care for themselves.

Catalog Free We will cheerfully send you our catalog, which fully explains the Carnes Artificial Arm and shows by actual photographs how Salesmen, Mechanics, Farmers, etc., are able to use it in their regular occupations. Write for a copy today.

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ACROMATIC TELESCOPE

Made upon new scientific principles, nicely brass bound with powerful lenses, scientifically ground. Travelers, hunters, farmers, boy scouts and everyone needs a telescope. Have you ever enjoyed the marvels of a telescope? Each telescope guaranteed just as represented, or money promptly refunded. Send 99 cents to-day.

Eastern Novelty Co., Dept. 79 **172 E. 93rd St., New York.**

NEW SCIENTIFIC WONDER

"X-RAY" CURIO

PRICE 12c COIN **BIG FUN**

BOYS You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. "A magic trick novelty *free* with each X Ray."

MARVEL MFG. CO., Dept. 47, NEW HAVEN, CONN.

Deafness

Perfect hearing is now being restored in every condition of deafness or defective hearing from causes such as

Relaxed or Sunken Drums, Roaring or Hissing Sounds, Perforated, Partially Destroyed Drums, etc.

Wilson Common-Sense Ear Drums

"Little Wireless Phones for the Ears" require no medicine but effectively replace what is lacking or defective in the natural drums. They are simple devices which the wearer easily fits into the ears where they are invisible. Soft, safe and comfortable to wear at all times.

Write *today* for our 168 page FREE book on DEAFNESS, giving you full particulars and plenty of testimonials.

WILSON EAR DRUM CO., Incorporated
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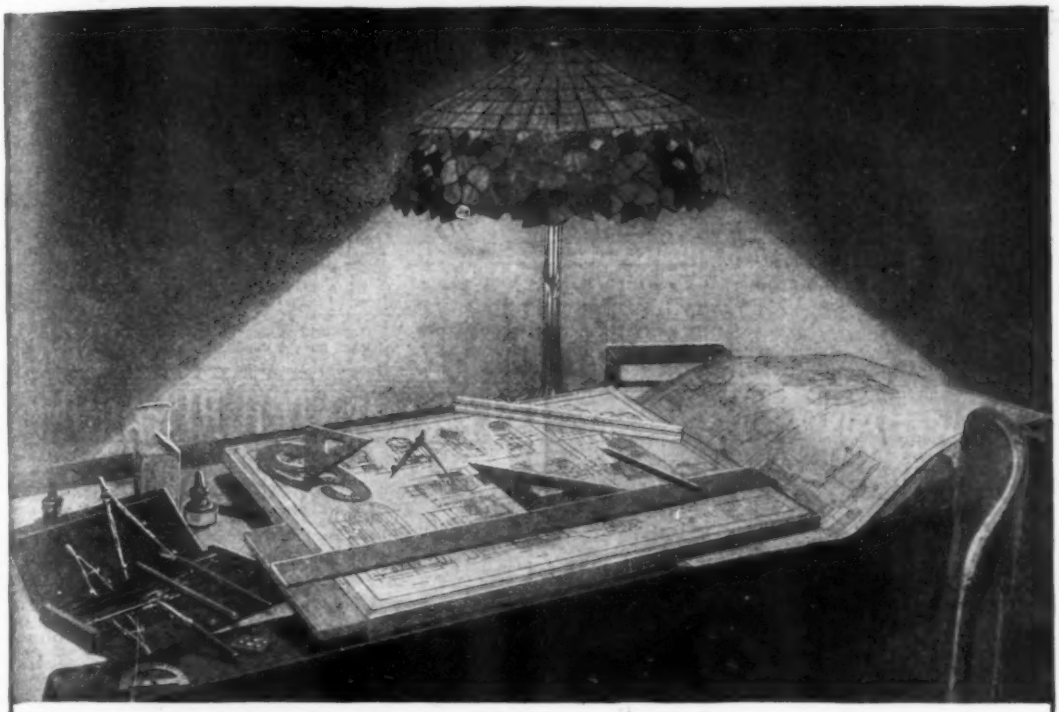

Draftsman's Complete Outfit FREE

Everything used by expert draftsmen given absolutely free to students. Outfit includes "professional" complete set of fine drawing instruments with double set of compasses and dividers all in velvet lined case. Drawing board, T square, two triangles, protractor, universal curve, triangular standard scale, water-proof ink, pens, pencils and all accessories—furnished you free in this expert's complete outfit.

Easy to Learn at Home

from Great School known all over the World

The Coyne Home Study course guarantees to train you. Remember, the Coyne Trade and Engineering Schools are recognized by educators all over the world. Students come from all over the world to get Coyne training. Why. Because of the Coyne schools' long established, tremendous reputation for successful teaching by its great staff of experts. Coyne is not a "one man" school but a great educational institution, 21 years old, an acknowledged leader and originator. Coyne originated the "Learn by Doing" method now endorsed by educators everywhere. Coyne has graduated thousands of successful, prosperous men all over the world. You can't make a mistake if you write for the Coyne free book. Coyne students say every minute of the course was enjoyable. Some students took **good position 3 months before their course was finished.**

Send for FREE Book

Mail this coupon for our interesting book, "Drafting the Foundation of Industry," sent you free. It explains all about the Coyne home study method and shows you how to become a draftsman in the quickest and easiest way. You want to know all about this great institution. Don't put it off. Send for this book now. It's absolutely free, no obligation. It contains the most valuable information you will ever get in your life. Send the coupon now.

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Draftsmen Make $225.00 to $500.00 a Month

There is a tremendous demand now for trained draftsmen. Employers are competing for men to fill positions. There will be no let up in this demand for many years to come. Now is the time to get started. Draftsmen get good pay from the very start and can work up to $500 a month *and more*. Draftsmen are needed everywhere. Once you are trained you can choose your own business and work in *any* part of the country you please. Don't be afraid you can't do it. Coyne training makes everything easy for you.

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Dear Sirs:—Please send me, absolutely free, without obligation, your book, "Drafting the Foundation of Industry," also full information about the Coyne Home Study Course in Drafting.

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WONDERFUL NEW DEVICE

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Miss Laura Writer, Oakwood, writes: "It is certainly a wonderful invention—a benediction to civilization. I have practiced just a short time and note a great change in form and speed. I wish everyone could grasp such an opportunity."

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EARN $125 TO $200 MONTHLY
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The Demand for Wireless Operators Far Exceeds the Supply

The New York Wireless Institute will make you an operator—AT HOME—in your spare time—quickly—easily and thoroughly. No previous training or experience required. Our entire Home Study Course has been prepared by Mr. L. R. Krumm, formerly Chief Radio Inspector, Bureau of Navigation, N. Y. Experts able to impart their practical and technical knowledge to YOU in an *easy to understand way* will direct your course. The graded lessons mailed you will prove so fascinating that you will be eager for the next one. The instruments furnished *free*, will make it as easy to learn the Code as it was to learn to talk. *All you will have to do*, is to listen.

BIG SALARIES

Wireless operators receive excellent salaries ranging from $125 to $200 a month and it is only a stepping stone to better positions. There is practically no limit to your earning power. Men who but yesterday were Wireless Operators are now holding positions as Radio Engineers, Radio Inspectors, Radio Salesmen at salaries up to $5000 a year.

TRAVEL THE WORLD OVER

A Wireless Operator can visit all parts of the world and receive fine pay and maintenance at the same time. Do you prefer a steady position without travel? There will be many opportunities for you at the numerous land stations or with the Commercial Wireless or with the Steamship Companies.

FREE Instruments and Text Books We furnish free to all students, during the course, *the wonderful receiving and sending set exactly as produced in the illustration.* **This set is not loaned, but GIVEN to all students completing the Course. The Transmitter shown** is the celebrated *Omnigraph* used by several Departments of the U. S. Government and by the leading Universities, Colleges, Technical and Telegraph Schools throughout the U. S. and Canada. Start the *Omnigraph*, place the phone to your ear and this remarkable invention will send you Wireless Messages, the same as though you were receiving them, through the air, from a Wireless Station hundreds of miles away. When you apply for your license, the U. S. Government will test you with the *Omnigraph*—the same model *Omnigraph* as we furnish to our students. Ask any U. S. Radio Inspector to verify this.

This wonderful Set for learning the Code given free with our Course.

FREE POST-GRADUATE COURSE

A one month's Post-Graduate Course, if you so desire, at one of the largest Wireless Schools in N. Y. City, New York—the Wonder City—the largest port in the world and the Headquarters of every leading Wireless and Steamship Company.

Easy Payments A small payment down will enroll you. We will make the payments so easy that anyone ambitious to enter the fastest growing profession—Wireless—may do so.

Send for FREE Booklet Without obligating you in any way, send for our Booklet "How to Become an Expert Operator"—it is free. Fill out and mail the coupon, postal or letter, but DO IT TODAY!

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Send me free of charge, your Booklet "How to Become an Expert Operator," containing full particulars of your Course and *Free Instrument Offer*.

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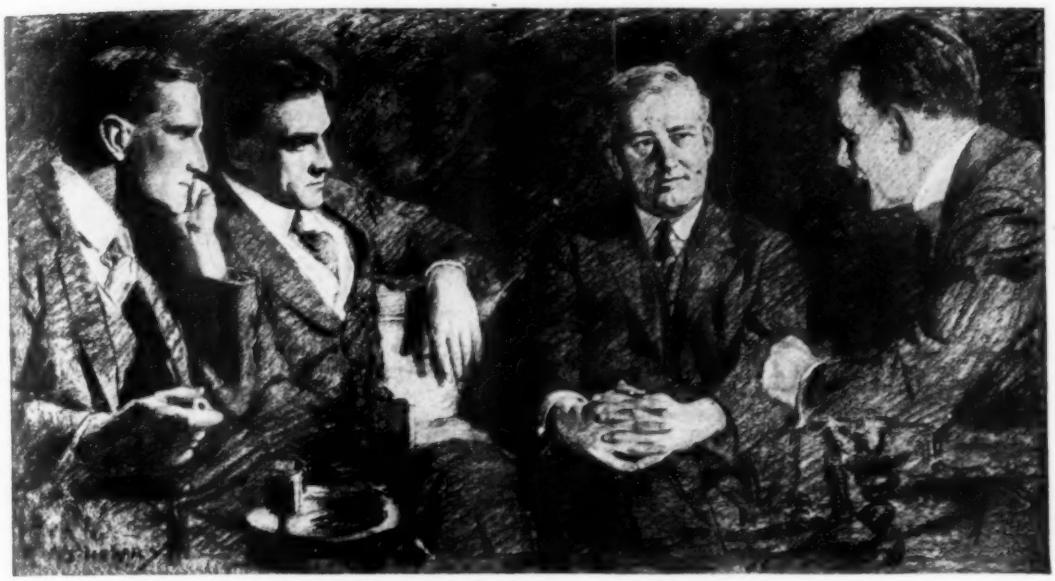

In one of these four men, perhaps, you will find a man whose position and income were much the same as yours.

What happens to the incomes of men?

FOUR average business men, typical of thousands of others who enrol for the Modern Business Course and Service of the Alexander Hamilton Institute—what happens to the incomes and the business positions of such men when they add an all-round business training to their practical business experience?

The answer to that question need not be left to guess-work. The Institute has the record of the progress of these four men—and several hundred like them—in their own handwriting.

These are the facts

AN assistant cashier was earning $3,000 a year at the time of his enrolment with the Institute; today he is vice-president and his salary is $7,200.

A purchasing agent was earning $4,000; today he is general manager, and his salary is $12,000.

A western manager's income, when he enrolled was $4,160 a year; and this year, as sales manager, he will earn $20,000.

A chief clerk was earning $2,500 when he decided to shorten his road to success by the Institute's help; today he is a department head in an important bank, and his income is $7,000.

The combined earning power of these men has increased more than 300%; and every one of them states in his own handwriting that the Alexander Hamilton Institute has been one of the most important, if not the most important factor, in his success.

"Would you advise other ambitious men to enrol?"

WE asked each one of them to answer that question in complete frankness.

"By all means," the vice-president answered, "because the knowledge one obtains is practical and not theoretical. Especially does this apply to men who have not had long years of schooling in youth."

"Would advise to enrol at once," the general manager answered. "It is a real help in understanding and solving everyday problems."

"Yes," said the department head, "because, other things being equal, advancement depends upon a broad knowledge of business facts and a firm grasp of business principles."

"Yes," said the sales manager, "because I feel that the time I invested in the Course was the best investment I ever made."

The result of training

TO such men increased earning power comes as a matter of course; neither they nor the Institute think in terms of money. They think in terms of achievement; the money takes care of itself.

Yet in days like these when the cost of living is a problem to every ambitious man, this fact, which many years' experience in training men for success has proved beyond a doubt, should be emphasized—*that increased income follows business training as inevitably as day follows night.*

"Forging Ahead in Business"

FOR your convenience all the facts you want are published in a book issued by the Institute entitled "Forging Ahead in Business." It tells just what the Modern Business Course and Service is, how it works and exactly what it has done for men whose problem was like your own. Fill in the coupon, mail it, and your copy of "Forging Ahead in Business" will come at once.

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Business Position.....

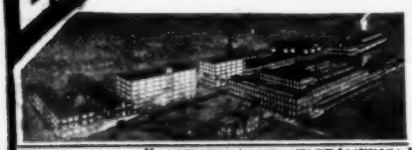
DETROIT

The Auto Center is the Logical Place To

LEARN AUTO AND TRACTOR BUSINESS

Detroit trained men, (the M.S.A.S. kind), are constantly in demand and are given preference all over the U. S. A. Employers know they have been trained according to factory specifications. That's why a diploma from the factory endorsed school in Detroit, the Auto Center, is a real start in business. Our graduates will tell you that employers were after them as soon as they finished their course, or that their garage was filled up with work as soon as people learned they had been to the M.S.A.S. in Detroit.

Thousands of Men Wanted



Good positions with big pay waiting for the trained man. Thousands of garages, repair shops and service stations needed now to keep the ten million automobiles, trucks and tractors now being used in repair. It is your opportunity.

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Your practice of co-operating with the factories is very commendable for it brings together the biggest men and most successful ideas to be had.

We will gladly co-operate with the Michigan State Auto School through our ninety branches in the United States in placing your tractor graduates. There is a constant demand for competent trained tractor men at very good wages. Very truly yours

INTERNATIONAL HARVESTER COMPANY OF AMERICA.

HUDSON

HUDSON MOTOR CAR COMPANY

DETROIT, MICH. U.S.A.

The Michigan State Auto School, in our opinion, is the finest institution of its kind in the country. In fact, we endorse its method of instruction.

We have recommended a great many students to them and the results were satisfactory. The Michigan State Auto School ranks highest in the standard of schools. Its equipment and personnel is second to none. This school is thought very highly of by the automobile men of Detroit and is considered one of the most efficient schools in the country. If you intend to visit any school, then by all means choose the best one. The Michigan State Auto School, so far as we know, is the best. You will make no mistake by entering for a course. Yours faithfully,

(Signed) T. W. MOMBELLE,
HUDSON MOTOR CAR COMPANY,
Service Department.

WHAT WE TEACH

Anyone can learn by our factory outlined, factory endorsed methods. M.S.A.S. training covers every point of knowledge and practice required of a successful automotive expert.

Automobiles and Tractors

We teach the automobile and tractor business from A to Z. Very thorough and complete training is given in electrics, starting, lighting, ignition, wiring, testing, repairing, including batteries, etc. Our equipment and instruction are positively the best obtainable. We give actual factory experience in assembling, block testing, bearing scraping, valve grinding, road testing, etc.

Farm Tractor Instruction

Complete and thorough instruction in the principles, construction and operation of automotive equipment used on the farm. Lighting plants, stationary engines, tractors, their care and repair are part of the M.S.A.S. Regular Course. **Tractor Course includes actual work on M.S.A.S. Eighteen Acre Tractor Farm.** The M.S.A.S. Tractor Farm, located at Detroit city limits, is fully equipped. Here the student gets actual field experience and instruction in addition to the complete course given in class rooms and mechanical departments. Our automobile course in connection with tractor course is highly praised by tractor men and manufacturers. Manufacturers of tractors, automobiles, trucks, farm lighting plants, etc., place their machines with us for instruction of students.

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Complete training for operating a tire repair shop or for production work in a tire factory. Course includes retreading, vulcanizing, all types of cord tires, etc.

Oxy-Acetylene Brazing, Welding and Cutting

Complete training in structural and repair work. The M.S.A.S. can teach you how to conduct a business of your own successfully. You become a life member of the school and our Graduates' Service Department is ever ready to render any assistance possible. You may return years later and "brush-up" on new equipment without charge.

Money-Back Guarantee

We guarantee to qualify you for a position as chauffeur, repair man, demonstrator, auto electrician, garage man, automobile dealer, tractor mechanic and operator or farm lighting expert, paying from $125 to $400 monthly, or refund your money.

Corner in M.S.A.S. Electric Dept.
Students working on Chalmers Chassis.

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THE HEART OF THE AUTO INDUSTRY

MICHIGAN STATE AUTO SCHOOL

"The Detroit Auto School" **"Endorsed by All Leading Manufacturers"**

312 Auto Building, 687-89-91 Woodward Avenue

DETROIT, MICHIGAN, U. S. A.

HAVE A BUSINESS OF YOUR OWN

Garage of R. Elridge Brooks, 381 North Street, Meadville, Pa., Graduate at M.S.A.S.

Brooks is only 18 years of age. Has garage of his own with Nash and Oakland agency. Says his success is absolutely due to M.S.A.S. training.

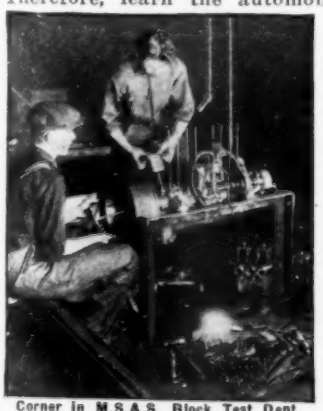
It is not an unusual thing for our graduates to make $500 a month in the garage business. Many of them are making more. These men are just ordinary fellows. Many of them had little or no capital and knew nothing of automobiles or tractors before training. They had, however, an ambition to get ahead and learned all about the auto business in 10 weeks at the M.S.A.S. in Detroit.

Make $500 a Month or More

You can succeed in the Automobile and Tractor business, too. Take our course—get a good job, then save a few hundred dollars. Start business for yourself. Many of our "grads" go right from our school into business. You can do the same. There are thousands of openings in good territory awaiting you.

Facts You Can't Afford to Overlook

You owe it to yourself to select the school that will make the best automobile and tractor man of you. Manufacturers say, train at the M.S.A.S. It is well to remember that manufacturers know their business. Our course is given as specified by them. Ours is a **factory outlined** and **factory endorsed** course. It is not the result of what one man knows about teaching the automobile and tractor business, but it is the result of what leading manufacturers, their service managers and factory engineers know, what all of them combined know about it. Our course is the result of the combined ideas, of the biggest, best and most successful men in each field. Nowhere else can this combination of ideas, this **factory outlined** and **factory endorsed** system be found. Therefore, learn the automobile business in Detroit, the Automobile Center, at the factory endorsed school, and be the best automobile and tractor man in your district.



Corner in M.S.A.S. Block Test Dept. Students building up a Buick Motor.

Enroll Now

This is the very best time of the year to get into our school —1921 equipment is already here and our facilities are greater than ever before. Investigate now.

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Send the coupon today for big 124-page illustrated catalog and copy of latest "Auto School News." They tell about Courses—show more than a hundred pictures of equipment—give letters from big Auto Factories and stories of success from graduates, and opportunities for you. Resolve to learn the business in Detroit, THE HEART OF THE AUTO INDUSTRY. Use coupon **now.**

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Wish to say that this is one of the best schools in the country, and would not hesitate to recommend it to anyone who is desirous of learning the automobile business. It is a recognized institution among the automobile factories of this city. Their methods of instruction, their lectures and theories are 100 per cent perfect. With all of their equipment and with the practical work that the students are able to get in their own organization, I really believe that mechanics throughout the country are missing one great opportunity if they do not take advantage of their course. MAXWELL MOTOR CO., INC.,
A. E. RICHMOND, Superintendent of Service.

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The Michigan State Auto School enjoys a very enviable reputation and is probably one of the best of its kind in the United States. Have no hesitation in recommending it in every particular.
Yours very truly,
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P. S.—Or, better still, you can expect me to look over your school about _____

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You merely put a Rosenthal Language Phone record on your phonograph and listen. You hear the cultured voice of a native professor. His pronunciation is perfect. He speaks of every-day matters. He asks and answers every-day questions. At the same time, *you* read aloud from the book, the same phrases that you hear spoken. Soon you are yourself saying what you hear—you are beginning actually to speak a foreign language, to understand it, and to think in it.

A Few Minutes of Spare Time

for a surprisingly short while—and you can converse in a foreign tongue. The Rosenthal Method makes this possible. Only a trained musician can learn a tune without hearing it—by merely looking at the printed notes. But anyone can learn a tune by listening to it several times. So with languages. The Rosenthal Language Phone Method enables *anyone* to learn a foreign tongue as easily as a new tune.

Simple, Practical, Speedy

You begin at once to speak and understand the language you take up. You acquire this ability in your own home—on your own phonograph, any make—in spare moments—at your convenience. No arbitrary lesson-hour or waiting teacher to consider—no distant classroom to go to. No rules to be learned, but perfect accent and grammar assured.

"Two-Language" Men and Women in Demand

Men and women, familiar with one or more foreign tongues, are being eagerly sought. Today, linguistic ability commands high pay—high in direct proportion to its comparative scarcity. Thousands of manufacturers of every conceivable product are entering the export field, who never before sold goods outside the United States. They must have "two-language" employees—sales managers, secretaries, correspondents, typists, clerks, traveling representatives. So, also, must the thousands of new *importers*. So, also, must the old established firms.

LANGUAGE PHONE METHOD

WITH ROSENTHAL'S PRACTICAL LINGUISTRY

Exporting and importing, however, are but two of the many fields in which a knowledge of languages is of great value.

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Over thirty-two million people in the United States—nearly one-third of the population—speak a foreign language. You can interest a man more thoroughly and convince him more quickly by talking or writing to him in his mother-tongue.

When you visit foreign countries—for pleasure or business—familiarity with the native languages is indispensable.

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Studying foreign languages by the Rosenthal Language Phone Method, can be made a social recreation. It is not a selfish and isolating pastime—but one that can be shared and enjoyed by any number.

Read the masterpieces of French, Spanish and Italian literature in the language in which they were conceived and written. The full flavor of foreign letters cannot be translated.

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How to Increase Your Income, through a knowledge of a foreign language, whether you are an employer or an employee, young or old, a professional man or woman, a practitioner of any of the arts or sciences—whoever, whatever and wherever you are. How to Acquire Conversational Fluency in a Foreign Tongue Quickly—and devote only ten minutes, three times a day, to study. How familiarity with even one foreign language Increases Your Prestige—in the drawing-room, the club, the office; Widens Your Circle of Acquaintances—social and commercial; Multiplies the Pleasures of Travel and Reading; Broadens Your Intellectual Horizon.

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Please send me by mail (without obligation of any kind) the free book about Language Study, together with details of your offer of a free trial, in my own home, of The Language Phone Method for Spanish, French or Italian.

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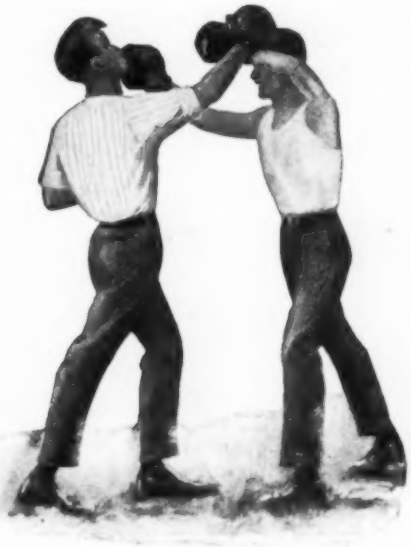
Surprise the best Boxer!



JUST imagine how tickled you'll be, the next time your pals have a boxing bout, to meet that chap who thinks he "knows it all" and box rings around him—show him blows he never knew existed, hit him wherever and whenever you please, and guard, duck and side-step so cleverly that he can't even land on you! This is easy when a fellow has learned the methods used by professionals.

Marshall Stillman, the pupil of the famous Professor Mike Donovan, is teaching boxing to hundreds of live young men—and to men as old as 60—right in their own homes. Over 10,000 pupils have studied his old course and think it wonderful. His new course is better still—and bigger.

The Great New Course

teaches boxing, jiu-jitsu, wrestling, physical development, etc.

The system is unique. Lessons are practiced before a mirror, and you start with such simple movements as reaching out your hand for a coin, the breast stroke in swimming, etc. Step by step you are led into striking heavy blows, guarding, ducking, feinting, side-stepping, just as if you had a real opponent before you. You are taught every good blow used in the ring, when to use it, where to land it, and how to guard against your opponent's blows.

To develop your speed, you practice three rounds of shadow boxing daily, using such scientific blows as the Mike Donovan Double, the Jack Dempsey Triple, the Bennie Leonard Triple, the Fitzsimmons Shift, etc.

Then comes instruction in Jiu-Jitsu—how to disarm an opponent with pistol, dagger or club, how to stop a kick, how to break a strangle hold on your throat, etc. The Wrestling Lessons include the Gotch Toe Hold, the Stetcher Scissor Hold, etc.

The Health Exercises are designed to build strength and endurance—not simply muscle—and include the Colon Exercise, a remedy for constipation, and Synthetic Breathing, a great lung developer and aid in curing nervousness.

Other features are a history of 69 great prize fighters, with their pictures (tells inside stories not generally known, their pet blows, etc.), lessons in Mass Boxing, an article on training, and a copy of the new International Sporting Club's Boxing Rules.

There are 246 illustrations—some course, 'eh?

Sent Free on Approval

We send the entire course (6 books) on approval. Order now, and pay for it on the 15th of next month ($5 in the U. S., $6 in Canada, $7 in other countries). If you don't like the course, return it in 10 days, and that will end the matter. But you'll keep it all right! Mail coupon now to Marshall Stillman Ass'n, Suite D-112, 461 Fourth Ave., New York.

Defeats Opponent Weighing 25 Pounds More

"My brother-in-law is about 25 pounds heavier than I am. He used to put the gloves on with me and slap me around at will, and in wrestling could pick me up bodily. But since studying your course I can land five punches to his one. Without letting my brother-in-law know that I was studying, I wrestled with him one day, and threw him on his back before he knew it." **THOMAS HEALEY.**
2112a B. Street, Granite City, Ill.

COUPON

MARSHALL STILLMAN ASSOCIATION,
Suite D-112, 461 Fourth Ave., New York

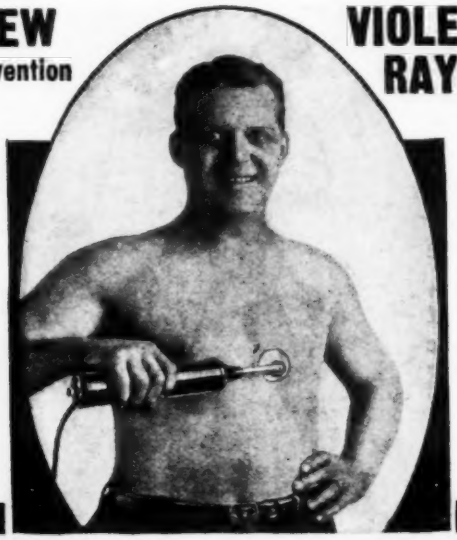
You may send me your complete course in Boxing and Self Defense, including extra instruction described above. I give you my pledge that you may feel safe in trusting me as agreed, and that I will pay $5 ($6 in Canada; $7 in other countries) for the course on the 15th of next month or return it in 10 days after I receive it.

Name .....

Address .....

NEW Invention

VIOLET RAYS



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Wonderful new kind of electricity. Thousands of volts go completely through your entire system, with no trace of shock or pain! Nikola Tesla's great discovery! Now used by thousands of physicians, chiropractors, osteopaths, drugless healers, hospitals, sanitariums. Amazing records made in quick relief of rheumatism, asthma, catarrh, colds, constipation, lumbago, nervousness, insomnia. Used by greatest beauty specialists in the country for ending dandruff, falling hair, pimples, blotches, skin eruptions, sallow skin. And now YOU can have Violet Ray treatments in your own home.

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Take twenty Violet Ray treatments in your own home. Would cost you $50 to $100 at your physician's or beauty specialist's. Special liberal offer. If you do not find quick relief, if you do not feel better, sleep better, eat better, look better, send it back and you will not be out one penny. Learn how you can have superb health and radiant beauty. 52-page health and beauty book sent free. Simply mail postal or letter now.

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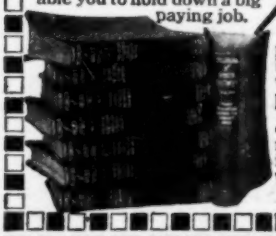

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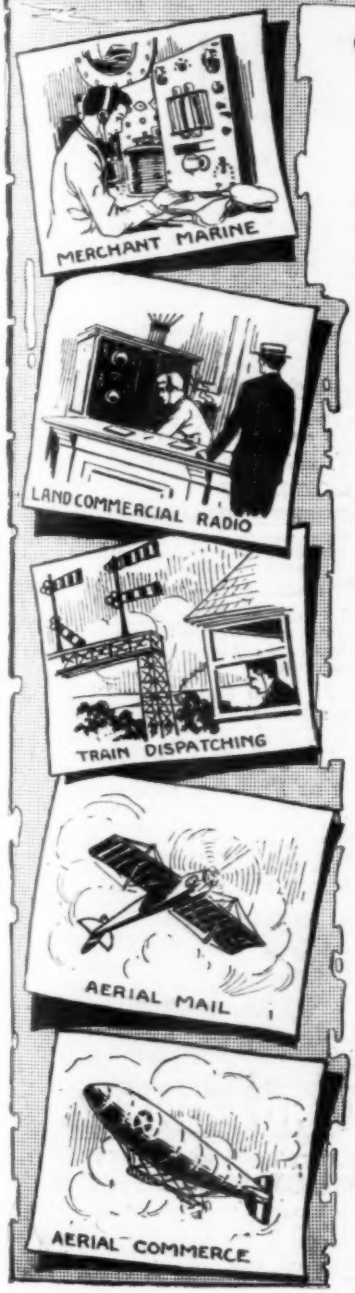

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During my engineering experience I found that it was hard for an earnest young fellow to get into the electrical game right and it was hard for a man in the game to make the progress he desired. I looked into the reasons for this situation and found what was needed. To remedy this condition is the purpose of the Burgess Course and Service, and they are today filling a much needed want. Furthermore, our standing is built upon what we have actually done, not what we claim to do. I do not promise you **$500.00 PER MONTH**, or that you will be able to qualify as an **ELECTRICAL ENGINEER** in a few months. As a matter of fact, some of those I have taught are getting and earning more than $500.00 per month and there are **ELECTRICAL ENGINEERS TAKING MY COURSE** at the present time. However, what you get in the way of money, or whether you become a **WATER-BOY** or **ELECTRICAL ENGINEER** depends in a great measure on you. You will admit this if you think a minute. What I do say is, that if you will do your part by following my instructions and advice, I will help you get into the electrical business if you wish to get into it, and if you are in it, I will supply you with information and help which will push you along faster. Zillman McNamara of Densmore, Kansas, wrote me one day, "YOUR COURSE MAKES A MAN STAND ON BOTH FEET." He expresses in a very few words exactly what I aim to do.

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The instruction is no cut and dried book plan, but is actually prepared with a view of fitting the individual. In this way one who is slow has the same advantage as others. The course covers the various subjects from simple dry cells to hydro-electric operation, particular effort being made on the really practical things and the things men need in their everyday work, such as —**storage batteries, wiring calculations, automobile systems, farm lighting systems, motor applications, motor installing, motor testing and repairing, armature winding, transmission and power plants, etc., etc.**

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As a thorough knowledge of the slide rule is so necessary in our business, I have written 30 lessons on this subject which are now included as part of the regular course in addition to the lessons on Electricity and Drafting. I am also supplying a Slide Rule and leather case to each student without charge.

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It is odd, but true, that the most astonishing thing about my business is the way in which it is handled. I actually do handle the instruction work myself, and I see to it that A STUDENT GETS WHAT HE WANTS. HE PAYS ONLY FOR WHAT HE GETS. That is 50-50. Furthermore, every student enrolls with the understanding that if he should have to discontinue for any reason, his monthly payments stop also. That is some more 50-50.

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A Subtle Principle of Success

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This subtle and basic principle of success requires no will power, **no exercise,** no strength, no energy, no study, no writing, no dieting, no concentration and no conscious deep breathing. There is nothing to practice, nothing to study and nothing to sell.

This subtle and basic principle of success does not require that you practice economy or keep records, or memorize or learn to do anything, or force yourself into any action or invest in any stocks, bonds, books, or merchandise.

This Subtle Principle must not be confused with memory systems, "will power" systems, Christian Science, psychology, magnetism, thrift or economy, nor should it be confused with health systems, auto-suggestion, concentration, "personality," self-confidence or opportunity, nor should this Subtle Principle be confused with initiative, mental endurance, luck, chance, self-analysis or self-control. Neither should this principle be confused with imagination, enthusiasm, persuasion, force or persistence, nor with the art or science of talking or salesmanship, or advertising.

No one has yet succeeded in gaining success without it.

No one has ever succeeded in failing with it.

It is absolutely the master key to success, prosperity and supremacy.

When I was eighteen years of age, it looked to me as though I had absolutely no chance to succeed. Fifteen months altogether in common public school was the extent of my education. I had no money. When my father died, he left me twenty dollars and fifty cents, and I was earning hardly enough to keep myself alive. I had no friends for **I was a negative** and of no advantage to any one. I had no plan of life to help me solve any problem. In fact, I did not know enough to know that life is and was a real problem, even though I had an "acute problem of life" on my hands. **I was blue and despondent** and thoughts of eternal misery arose in my mind constantly. I was a living and walking worry machine.

I was tired, nervous, restless. I could not sleep. I could not digest without distress. I had no power of application. Nothing appealed to me. Nothing appeared worth doing from the fear that I could not do anything because of my poor equipment of mind and body. I felt that **I was shut out** of the world of success and I lived in a world of failure.

I was such a pauper in spirit that I blindly depended on drugs and doctors for my health, as my father before me. I was a **"floater"** and **depended on luck** for success. The result of this attitude on my part was greater weakness, sickness, failure and misery as is always the case under similar conditions.

Gradually my condition became worse. I reached a degree of misery that seemed intolerable. I reached a crisis in my realization of my failure and adverse condition.

Out of this misery and failure and pauperism of spirit—out of this distress—arose within me a desperate reaction—"a final effort to live"—and through this reaction, arose within me, the discovery of the laws and principles of life, evolution, personality, mind, health, success and supremacy. Also out of this misery arose within me the discovery of the inevitable laws and principles of failure and sickness and inferiority.

When I discovered that I had unconsciously been employing the principles of failure and sickness, I immediately began to use the principles of success and supremacy. **My life underwent an almost immediate change.** I overcame illness through health, weakness through power, inferior evolution by superior evolution, failure by success, and converted pauperism into supremacy.

I discovered a principle which I observed that all successful personalities employ, either consciously or unconsciously. I also discovered a principle of evolution and believed that if I used it, that my conditions would change, for, I had but one disease—failure, and therefore there was but one cure—success and I began to use this principle and out of its use arose my ambition, my powers, my education, my health, my success and my supremacy, etc., etc.

You may also use this principle of success deliberately, purposefully, consciously and profitably.

Just as there is a principle of darkness, there is also a principle of failure, ill health, weakness and negativeness. If you use the prin-

ciple of failure consciously or unconsciously, you are sure always to be a failure. Why seek success and supremacy through blindly seeking to find your path through the maze of difficulties? Why not open your "mental eyes" through the use of this subtle success principle, and thus deliberately and purposefully and consciously and successfully advance in the direction of supremacy and away from failure and adversity?

I discovered this subtle principle—this key to success—through misery and necessity. You need never be miserable to have the benefit of this subtle principle. You may use this success principle just as successful individuals of all time, of all countries, of all races, and of all religions have used it either consciously or unconsciously, and as I am using it consciously and purposefully. **It requires no education,** no preparation, no preliminary knowledge. Any one can use it. Any one can harness, employ and capitalize it, and thus put it to work for success and supremacy. Regardless of what kind of success you desire, this subtle principle is the key that opens the avenue to what you want.

It was used by

Moses,		Shakespeare,
Caesar,	George Washington,	Mozart,
Napoleon,	Marshall Field,	Mendelssohn,
Roosevelt,	Sarah Bernhardt,	Copernicus,
Rockefeller,	Galli-Curci,	Confucius,
Herbert Spencer,	Nordica,	Mohammed,
Emerson,	Melba,	Cicero,
Darwin,	Cleopatra,	Demosthenes,
Morgan,	Alexander the Great,	Aristotle,
Harriman,	Edison,	Plutarch,
Woodrow Wilson,	Newton,	Christopher Columbus,
Charles Schwab,	Wanamaker,	Vanderbilt,
Lloyd-George,	Phil Armour,	Marcus Aurelius,
Charles E. Hughes,	Andrew Carnegie,	Pericles,
Abraham Lincoln,	Frick,	Lycurgus,
Clemenceau,	Elbert Hubbard,	Benjamin Franklin,

and thousands and thousands of others—the names of successful men and women of all times and of all countries and of all religions, and of all colors, make a record of the actions of this Subtle Principle of Success. None of these individuals could have succeeded without it—no one can succeed without it—no one can fail with it.

Every one realizes that human beings owe a duty to each other. Only the very lowest type of human being is selfish to the degree of wishing to profit without helping someone else. This world does not contain very great numbers of the lowest and most selfish type of human beings. Almost everyone, in discovering something of value, also wants his fellowman to profit through his discovery. This is precisely my attitude. I feel that I should be neglecting my most important duty towards my fellow human beings, if I did not make every effort—every decent and honest effort—to induce everyone to also benefit to a maximum extent through the automatic use of this subtle principle.

I fully realize that it is human nature to have less confidence in this Principle because I am putting it in the hands of thousands of individuals, but I cannot help the negative impression I thus possibly create. I must fulfill my duty to each member of humanity, just the same.

I do not urge anyone to procure it because I offer it without any obligation whatsoever. I urge everyone to procure the Subtle Principle of Success because the results it holds in store for each individual are great—very great.

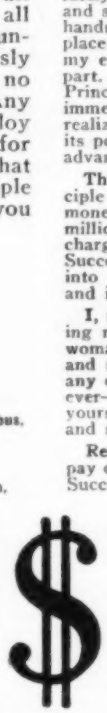
This subtle principle is so absolutely powerful and overmastering in its influence for good, profit, prosperity and success that it would be a sin if I kept it to myself and used it only for my personal benefit.

So sure am I of the truth of my statements—so absolutely positive am I of the correctness of my assumption and so absolutely certain am I that this Principle in your hands will work wonders for you—that I am willing to place this Subtle Principle of Success in your hands, at my expense, without any obligation whatsoever, on your part. You will recognize the tremendous value of this Principle within less than thirty minutes—in fact, almost immediately, as you become conscious of it, you will realize its practicability, its potency, its basic reality and its power and usability for your personal profit, pleasure, advancement, prosperity, success and supremacy.

Thousands of individuals claim that the Subtle Principle of Success is worth a thousand dollars of anyone's money. Some have written that they would not take a million dollars for it. You will wonder that I do not charge a thousand dollars for the Subtle Principle of Success for disclosing this Principle—after you get it into your possession and realize its tremendous power and influence for your success and supremacy.

I, myself, have derived such tremendous results—amazing results—from its power, that I want every man and woman to have this key to success, prosperity, wealth and supremacy. This is why I am willing to send it to any one—to any address, without any obligation whatsoever—this Subtle Principle of Success is yours to keep, yours to use for the attainment of your success, happiness and supremacy.

Remember, you are under no obligation whatsoever, to pay or to return anything to me. The Subtle Principle of Success is yours to keep.



You would never forgive me, and I could never forgive myself, nor could the creative forces of the Universe forgive us, if I failed to bring you to the point of using this subtle principle of success. You would never forgive me if I failed to do for you that which you would do for me, if our positions were reversed.

You want success of some kind. This is your opportunity to get it—to get what you want.

Write your address on the form below, or write me a postal or a letter, asking me to send you the Subtle Principle of Success without any obligation of any kind whatsoever, on your part, and you will receive by return mail, the Subtle Principle of Success—a Principle of supremacy—the key to your every success—the equal of which you have never seen.

ALOIS P. SWOBODA, 812 Berkeley Building, West 44th Street, New York City

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ALOIS P. SWOBODA, 812 Berkeley Building, West 44th Street, New York City

You may send me at your risk and expense, the Subtle Principle of Success.

I promise you and myself to help myself to the utmost through the Subtle Principle of Success.

I promise to accept the Subtle Principle of Success with an eager and open mind for my advantage.

I am above seventeen years of age and I am sincere and honest in my statements and promises.

It is understood that I am not obligated to return or to pay for the Subtle Principle of Success.

Name .....
(write plainly)

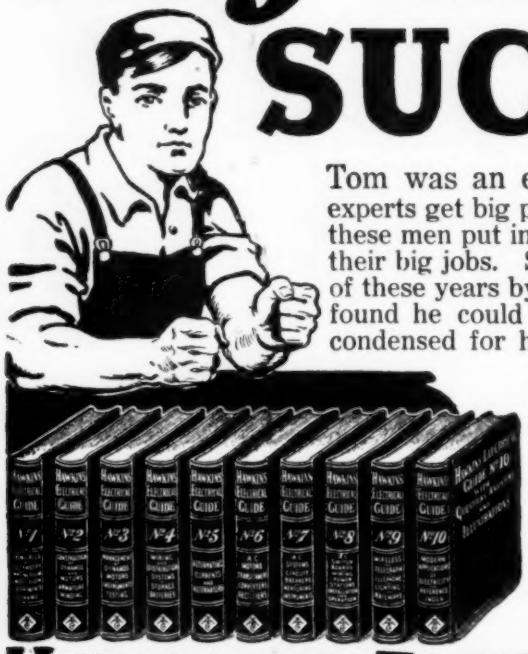
Address .....

City .....

State .....

Note—The above statement is absolutely guaranteed in every way to be as represented.

Why did Tom SUCCEED?



Tom was an electrical worker. He knew electrical experts get big pay and have fine homes. But he also knew these men put in long years of work to learn enough to hold their big jobs. So he asked himself if he couldn't **skip** some of these years by using their knowledge to **start** with. He found he could because this knowledge was collected and condensed for him in HAWKINS ELECTRICAL GUIDES.

Tom sent for these guides. He used them at every opportunity and soon he astonished his boss with his newly acquired knowledge. His pay was soon raised ——— he kept going ahead and today Tom holds the kind of a job he always wanted at the salary he wanted to get.

These books can help you as they helped Tom. Just think—in them you have a wonderful work for daily reference or study with 4700 illustrations and 3500 pages covering all the subjects, principles, practices, problems, troubles and ways of doing things electrically.

HAWKINS ELECTRICAL GUIDES

Do you want to know the facts about the following electrical subjects? They are all covered in Hawkins Electrical Guides.

Electrical signs and symbols—static and current electricity—primary cells—conductors and insulators—resistance and conductivity—magnetism—induction coils—dynamo principles—classes of dynamos—armatures—windings—commutator brushes. Motor principles—armature reaction—motor starting—calculations—brake horsepower—selection and installation of dynamos and motors—galvanometers—standard cells—current measurement—resistance measurment—voltmeters—wattmeters—watthour meters—operation of dynamos—operation of motors. Distribution systems—wires and wire calculations—inside, outside and underground wiring—sign flashers—lightning protection—rectifiers—storage battery systems. Alternating current principles—alternating current diagrams—the power factor—alternator principles—alternating construction—windings. A. C. Motors—synchronous and induction motor principles—A. C. commutator motors—induction motors, transformers; losses, construction, connections, tests—converters—rectifiers. Alternating current systems—switching devices—circuit breakers—relays—lightning protector apparatus—regulating devices—synchronous condensers—indicating devices—meters—power factor indicators—wave form measurement—switch boards. Alternating current, wiring power stations—turbines: management, selection, location, erection, testing, running, care and repair—telephones. Telegraph—simultaneous telegraphy and telephony—wireless—electric bells—electric lighting photometry. Electric railways—electric locomotives—car lighting—trolley car operation—miscellaneous applications—motion pictures—gas engine ignition—automobile self-starters and lighting systems, electric vehicles. Elevators—cranes—pumps—air compressors—electric heating electric welding—soldering and brazing—industrial electrolysis—electro-plating—electro-therapeutics—X-rays.

Also a complete 126-page ready reference index of the complete library. This index has been planned to render easily accessible all the vast information contained in the 10 Electrical guides. There are over 13,500 cross references. You find what you want to know **instantly.**

The set contains ten wonderfully helpful and practical volumes—written in clear, concise language—easy to understand—no wasted words—full of up-to-the-minute electrical knowledge which you can apply to the problems that come up.

The Guides fit your pocket. You can carry a number with you till you have mastered its contents. All subjects are indexed so that you can find the information instantly. Written in the modern question and answer form. It's like having an electrical authority always at your elbow ready to answer any question you ask.

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Send no money. Examine the books first—use them in your work—pick up some information that will increase your earning ability. Decide for yourself that they are the most complete and clearly written electrical books ever published. Every book is complete in itself but the entire set is the best bargain. Accept this unusual offer now—mail the coupon today.

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3,500 Pages
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THEO. AUDEL & CO., 72 Fifth Avenue, NEW YORK, N. Y.

TEAR OFF HERE

Please submit me for free examination **Hawkins Electrical Guides (price $1 each).** Ship at once prepaid, the 10 numbers. If satisfactory I agree to send you $1 within seven days and to further mail you $1 each month until paid.

NAME ..... POSITION .....

STREET & NO. ..... FIRM .....

CITY & STATE ..... REFERENCE P.M.Dec.1920

From Day Laborer *to* Power Plant Expert

GEORGE H. DIMAN

FROM a day laborer earning $1.25 a day to a Power Plant Expert—that is the story of George H. Diman of Lawrence, Massachusetts, as told in a recent issue of "Power."

Mr. Diman started to work at an early age in a small power plant at Fall River. Little attention was being paid to the question of fuel economy in Mr. Diman's time, but he saw an opportunity for a saving along these lines and as a result made a thorough study of the subject of combustion, using whatever books were available in those days—and these were few and hard to understand.

His own words below tell of the first step in his successful career as power plant expert and owner—the direct result of his spare time reading.

"It was against the rules to read during working hours and one day my employer came into the engine room and found me reading an English book on combustion. There were not many American books on this subject at that time. He asked me what I was doing and I replied that I was trying to better myself for my own benefit as well as that of my employer. He took up the book in a gruff manner, looked it over and went out. Next pay day I found a substantial raise in my pay envelope."

Conditions have changed since Mr. Diman started his study of combustion. Economy in handling fuel is more necessary today than it ever has been. There are unlimited opportunities at the present time for the man who will learn good boiler room practice and obtain a better knowledge of combustion.

Employers today are even more anxious to pay their men well who are interested in saving fuel, as is evidenced in the letter below from one of our students, Mr. Samuel A. Clark of Pittsfield, Mass. He says:

"My company has informed me that they are very much pleased to think that I have enough interest in fuel problems to take up the study of combustion. They wish to show their appreciation by paying for my enrollment in full. This comes as a result of you notifying them of my enrollment and my progress to date."

How to Learn Combustion Engineering in Your Spare Time

For the first time, you have the opportunity of obtaining a thorough knowledge of combustion thru a non-resident Course, written in simple, everyday language for you—easy to understand—and completely illustrated. It is just as interesting as it is instructive.

The leading authorities on Combustion have prepared and are directing this easy reading Course. Joseph W. Hays, Author and Educational Director, is widely known as one of the leading contributors to the literature of the subject. The educational staff of reviewing and advisory editors includes the best known men in the combustion field, all specialists and authorities on Combustion Engineering and Plant Management.

No technical education is needed to follow the Hays Course and Service. It requires only an average of one-half hour daily to complete it on the regular schedule. The enrollment fee is very reasonable and easy terms of payment are allowed if necessary.

The Course has been highly endorsed by leading engineering firms thruout the country, many of whom have recommended the Course to their employees, and in a number of plants as many as fifteen to twenty men are enrolled.

Send for Free Book—

"Opportunities for the Combustion Expert

For those men who want to forge ahead in the combustion field we have prepared a handsome and interesting book, full of fuel-saving hints, entitled "Opportunities for the Combustion Expert." A copy will be sent free upon request.

If you are interested in a real chance to make a big success for yourself in this most lucrative field quickly and surely, by devoting a little of your spare time, return the coupon below today. Hays School of Combustion, Dept. 709, 1412-14 S. Michigan Ave., Chicago, Ill.

Send for Free Book—
"Opportunities for the Combustion Expert"

Name .....

Position .....

With .....
(Name of Company)

Address .....

City .....

State .....

Hays School of Combustion
Dept. 709 1412-14 S. Michigan Ave. Chicago, Illinois

THE US ARMY TEACHES TRADES

In the Army you can learn to be a *skilled* man in any of a hundred trades—

You can earn a good living while you're learning—

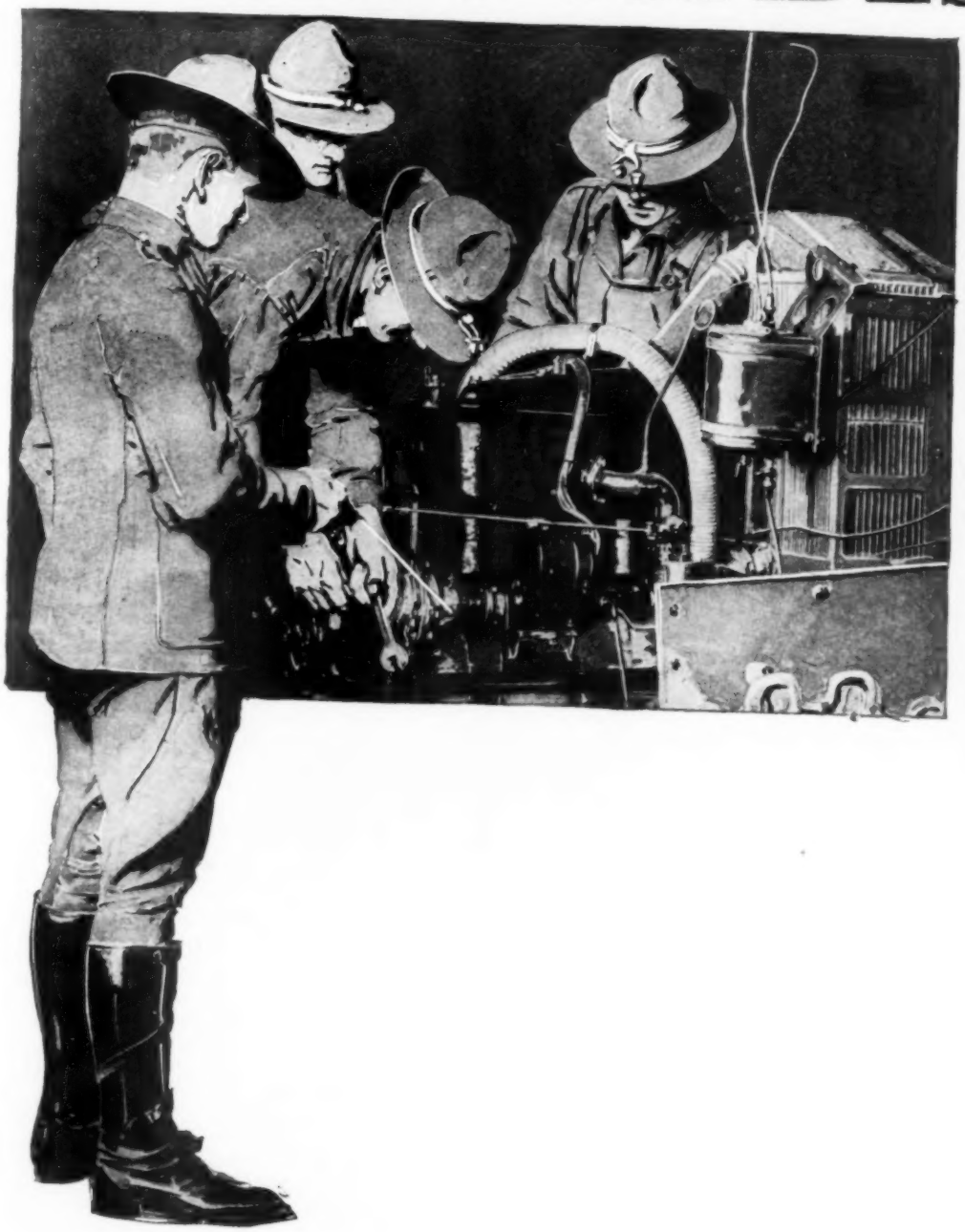
You have money in your pocket at the end of the month—

You get about a bit, see new places, meet new people—

Then, when you go back to civil life, you've got the special training that is in demand, the skill that will bring you more pay, a good job where you want it.

Earn, Learn and Travel

THE US ARMY TEACHES TRADES



Give It For Christmas—

An ideal gift that has all the appeal of extreme usefulness—a gift that will last for years—

ADJUSTO-LITE, a lamp that you can attach anywhere — to bed, shaving mirror, table, desk or chair. Stands perfectly wherever an ordinary lamp is used. Throws the light exactly where you need it most. Prevents eye strain. Cuts lighting cost.

Gripping clamp is felt-faced and cannot scratch. Compact. Durable. Solid brass. Guaranteed for five years—price $5.75.

Ask for Adjusto-Lite at the store where you usually trade. If they don't carry it, order direct.

S. W. FARBER

141-151 So. Fifth St., Brooklyn, N. Y.

"IT Clamps Everywhere"

Prices in U. S. A., complete with 8-foot cord, plug and socket. Brush Brass finished, $5.75; Statuary Bronze or Nickel finish, $6.25. Far Western prices, 25c per lamp higher.

Dealers: Write us for particulars of this fast selling specialty.

Adjusto-Lite

A FARBERWARE PRODUCT

Home Built For $500 Less

Because he built an Aladdin Home this man undercut prices by one-third

"My new home cost $500.00 less than local builders' figures. Everyone who saw the house being built knows that it contains the best grade of material. It is as well built as any substantial, durable and handsome house in town. It is double floored in both stories and the floor and walls are lined to keep out the cold. I frankly do not believe that even for the additional $500.00 that figured in the next lowest bid, it would have been possible to erect by any other method as fine a home as mine.

All Material Shipped Complete

When the material for my home was delivered by freight it came in one complete shipment. Not only the lumber, but the nails, locks, hinges, lath, plaster, window frames, doors, paint—everything in fact, came in one sealed box car. I have heard enough of the difficulties people encounter in getting delivery of this or that necessary item when they buy material from various sources. I bought all my material complete from one source and never had a single worry or a moment's delay on account of needing some missing article.

House Quickly Erected

In twenty-one working days after unloading the material the house was finished and ready for occupancy. During those twenty-one days I kept accurate record of every dollar expended. As the days went by I saw clearly I was going to under cut the lowest bid that had been offered to me before I discovered the Aladdin System of homebuilding. My complete saving amounts to at least $500.00, about one-third of the bill of material.

Sent for Book of Homes

Originally I had intended to employ an architect but a friend loaned me a book of plans from which I selected a very suitable design. Local builders gave me estimates of the cost to build a house of the design I had selected. Just before closing a deal an advertisement I saw caused me to send for a catalog of Readi-cut houses. The catalog came in prompt response to my request. I found in it a design a trifle larger but substantially the same as the one on which I had received estimates. The catalog price caused me to write at once to the manufacturers for full particulars.

All Material Cut-to-Fit

I learned that the lumber for Readi-cut houses is all cut-to-fit according to standardized methods. This system eliminates the wastage of odd pieces that ordinarily would occur where the sawing is done on the site of the building. The saving amounts to 18% of the lumber costs. The factory method of cutting the lumber by gang-saws, mitre-machines and other labor-saving devices reduces carpenter costs on the job by at least 30%.

Practically Wholesale Price

The Aladdin Company manufactures houses in enormous quantities, thus selling the houses direct to the homebuilder at an immense saving under local retail prices in which so many middleman profits have been included. I was convinced that it was safe, sure and economical to buy an Aladdin Readi-cut Home and the results have more than justified my faith.

Is a Satisfied Customer

I am satisfied with my dealings with The Aladdin Company. My home has attracted favorable comment here and it meets all my expectations. If I ever build again I will build another Aladdin Home because I know in advance I shall get more for my money than I could otherwise."

Homebuilders to the Nation

This is the story of hundreds, yes, even thousands of other homebuilders. Aladdin Homes are known from Maine to California, from Puget Sound to the Gulf, and wherever they have been built they have brought satisfaction. No matter where you live there is an Aladdin Home near you.

Wonderful Advantages Offered

Aladdin Homes are sold to the individual buyer at prices that are equivalent to what would be wholesale prices in ordinary merchandise. Aladdin lumber comes direct from the great lumber producers, and is bought in tremendous quantities at a great saving in price.

Aladdin's use of standardized lengths and scientific cutting eliminates wastage, which in the old way of building amounted to 20% of the total cost of the lumber for which the homebuilder paid.

All the material required for an Aladdin Home is furnished complete as specified and according to the plans. Satisfaction is guaranteed.

Quick Service from Mills

Aladdin Mills and distributing offices are located in the four greatest timber-producing areas of this country so that house material is shipped direct from the forest by the shortest possible haul, making quick service. Short hauls mean low costs.

Aladdin designs include arrangements and architecture to suit everyone. The plans are the result of highest talent and long experience, and there is a large variety to choose from.

Aladdin is referred to as the National Homebuilding Service. It is the American way of saving dollars for fellow Americans, modern production (by original method) of a better product for less cost than has ever been accomplished before.

Send for "591 Aladdin Homes"

Do you own a home of your own? Do you intend to build? Ask Aladdin for a copy of the book that has led others to success in homebuilding. It is called "591 Aladdin Homes."

The Aladdin Company

Bay City Michigan

BRANCHES AND MILLS

Portland, Ore., Wilmington, N. C., Hattiesburg, Miss., Toronto, Ont., Can. Write to the nearest office.

COUPON

THE ALADDIN COMPANY

Enclosed find stamps for which please send me the book "591 Aladdin Homes."

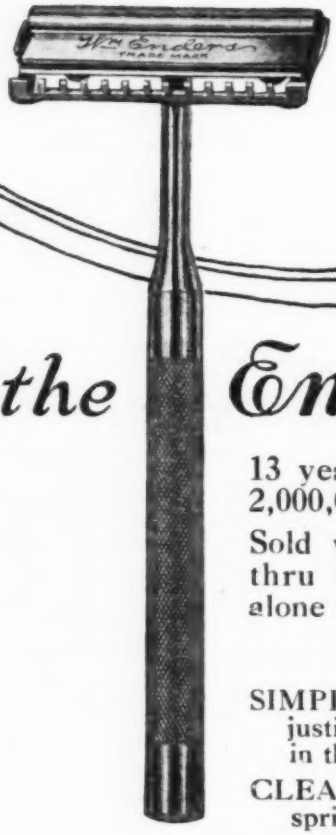
Name.....

Street.....

City.....

State.....

A RECORD



for the Enders-Razor

13 years on the market—more than 2,000,000 in regular use.

Sold without a line of advertising—thru the personal recommendation alone of its enthusiastic friends.

The Reasons:

SIMPLICITY—only three parts. No adjusting. Apart in one second—together in three.

CLEANLINESS—no holes, no screws, no springs; instantly cleaned.

SAFETY—patented guard holds the blade firmly in place.

PRICE—One dollar.

Shaving with the Enders is *"Just like wiping your face with a towel."*

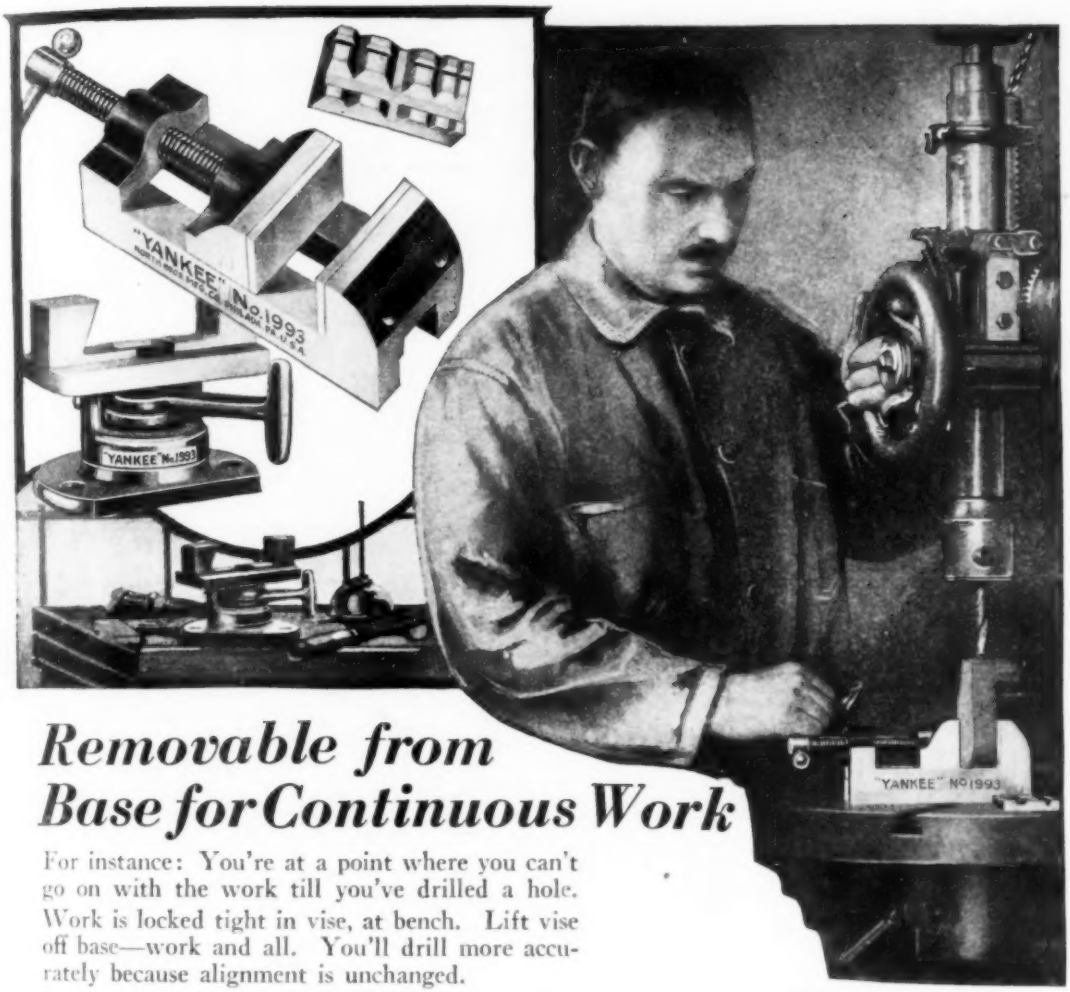
ENDERS SELLS FOR $1.00 with six blades of the best quality Swedish-base steel. Packed in a black Keratol box, velvet-lined. Extra blades, package of 5—35c.

FOR SALE BY BEST DEALERS EVERYWHERE

Wm Enders

ENDERS SALES COMPANY

17 Battery Place, New York

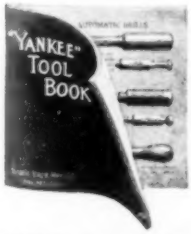


Removable from Base for Continuous Work

For instance: You're at a point where you can't go on with the work till you've drilled a hole. Work is locked tight in vise, at bench. Lift vise off base—work and all. You'll drill more accurately because alignment is unchanged.

Back to bench—and a twist of the set-screw fastens vise firmly to base again.

Use the "Yankee" Vise in any position. Sides, ends, top, bottom—all are machined perfectly true.



Your Dealer Can Supply You

Write for free "Yankee" Tool Book. Shows all the famous "Yankee" Tools in action. You'll find it mighty handy as a reference.

The "YANKEE" Vise

Removable from Base for Continuous Work

No. 1993—*With Swivel Base. Cam-throw lever locks vise in any position. Set-screw releases vise from base. Body 7¼ x 2¾ (wide) x 3 in. Jaws open 3⅛ in.*

No. 993—*Same as No. 1993, but without Swivel Base.*

No. 1992—*Body 4⅞ x 2 (wide) x 2⅛ in. (new size). Jaws open 1 13/16 in.*

No. 1991—*Body 3⅝ x 1½ (wide) x 1½ in. (new size). Jaws open 1½ in.*

NORTH BROS. MFG. CO., Philadelphia

"YANKEE" TOOLS

Make Better Mechanics

The Brunswick Method of Reproduction

A Master Stroke of Invention

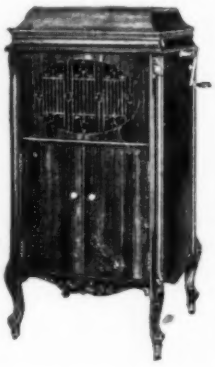
The only true all-record reproducer

The Ultona, pictured above, is one of the greatest advances in the evolution of the phonograph.

It is not an attachable appliance, but an integral part. It plays *all* makes of records. With a turn of the wrist it presents to each record the proper needle, with just the weight and at just the angle intended.

It is scientifically counterbalanced, doing away with those "scratching noises" which come from too much rigidity.

The Ultona is exclusive with Brunswick. So too is the Brunswick Oval Tone Amplifier, an all-wood tone chamber, containing no metal. It banishes the old-time stridency.



As a result of these two features, Brunswick tones are incomparably better and finer, as you will find at your first hearing. Visit any Brunswick dealer. Brunswick Shops are everywhere. Hear your favorite selections. Then judge for yourself.

Also hear Brunswick Records. They can be played on any instrument using steel or fibre needles.

THE BRUNSWICK-BALKE-COLLENDER COMPANY

General Offices: 623-633 South Wabash Ave., Chicago

Branch Houses in Principal Cities of United States, Mexico and Canada

Canadian Distributors: Musical Merchandise Sales Co., 79 Wellington St., West, Toronto

Brunswick
PHONOGRAPHS AND RECORDS

Kodak as you go.

Eastman Kodak Company, Rochester, N. Y.

Every Giver

EVERYBODY can give Eversharp to everybody because everybody writes and can use Eversharp every day, year after year. Eversharp is ever sharp and never sharpened; is ever useful, ever saving of time and motions, ever attractive and, therefore, ever appreciated everywhere. Wahl craftsmanship has equipped Eversharp for every pencil purpose and designed Eversharp to satisfy every fastidious taste. Make sure you GIVE Eversharp—the name is on the pencil. Styles for pocket, chain, purse or hand bag. Prices, $1 upward. Dealers everywhere.

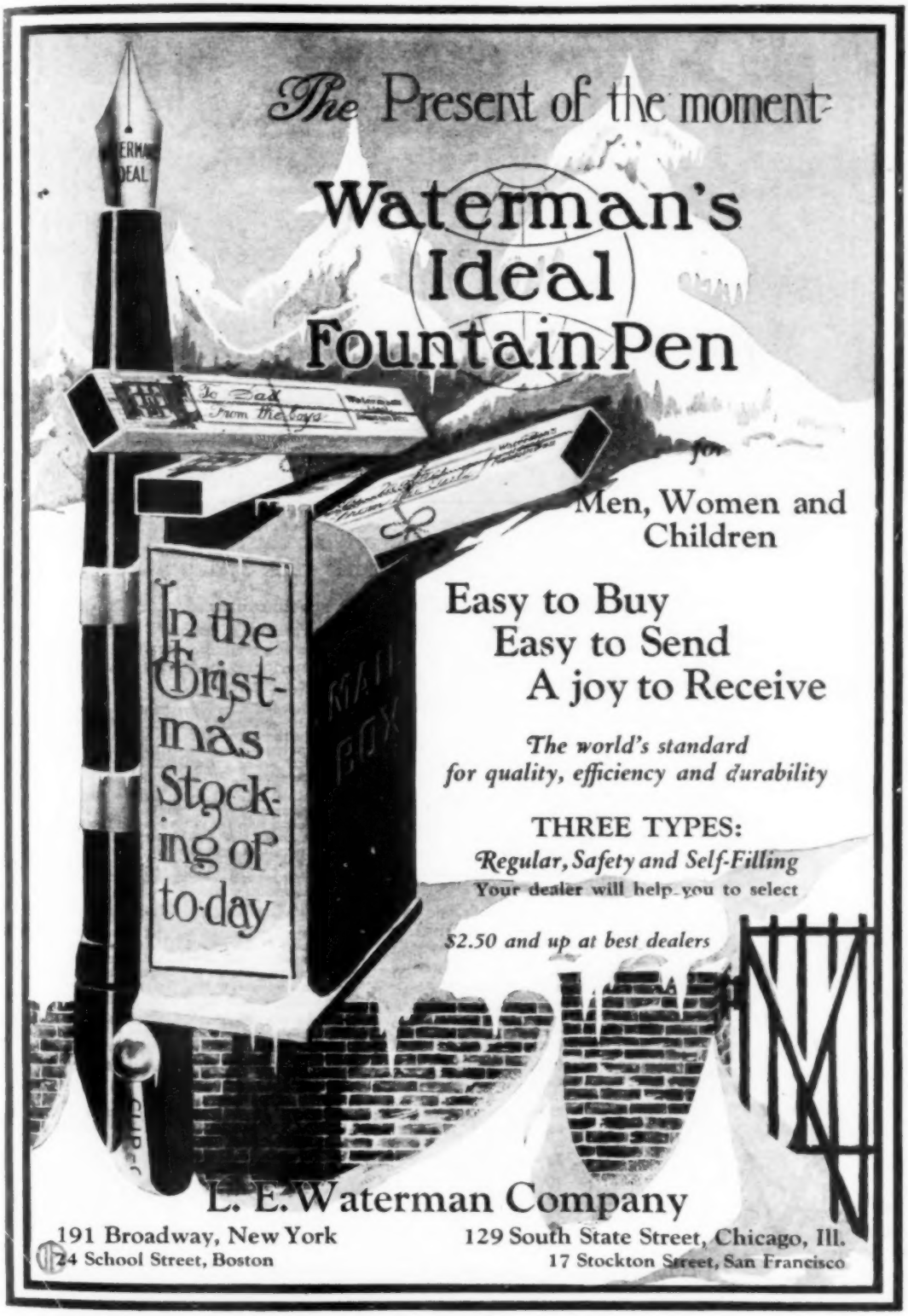
THE WAHL COMPANY, Chicago

Eastern Office: 165 Broadway, New York City. Western Representatives: Bert M. Morris Company, 444 Market Street, San Francisco. Canadian Representatives: Rowland & Campbell, Ltd., Winnipeg, Canada; Consolidated Optical Company, Toronto, Canada

EVERSHARP

Companion of the Tempoint Pen

WAHL PRODUCTS


The Present of the moment
Waterman's
Ideal
Fountain Pen
for
Men, Women and
Children
Easy to Buy
Easy to Send
A joy to Receive
The world's standard
for quality, efficiency and durability
THREE TYPES:
Regular, Safety and Self-Filling
Your dealer will help you to select
$2.50 and up at best dealers
In the Christmas Stocking of to-day
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L. E. Waterman Company
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24 School Street, Boston
129 South State Street, Chicago, Ill.
17 Stockton Street, San Francisco

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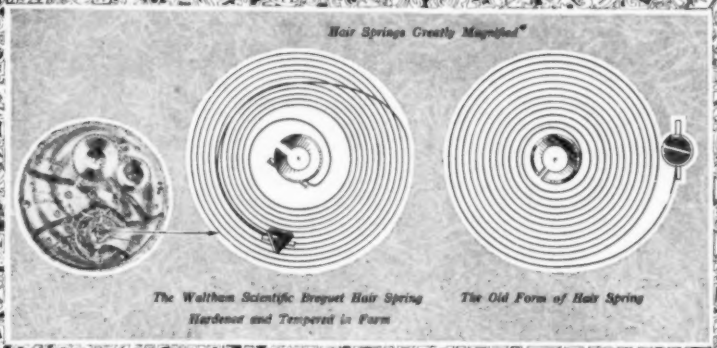


THE MOST SCIENTIFICALLY BUILT WATCH IN THE WORLD

The Waltham Scientific and Exclusive Process of Hardening and Tempering the Hair Spring in Form

THE Hair Spring is to the balance wheel of a watch what gravity is to the pendulum of a clock.

The Hair Spring is so extremely important in its mechanical functions that we affirm — a watch is only as good as its Hair Spring.

Therefore, the Hair Spring that most closely approximates perfection in the watch you buy gives you more value for your money as a time-keeper and as an appreciated investment.

The Waltham Hair Spring is the only Breguet Hair Spring in the world that is hardened and tempered in form.

In other words, the end of the unscientific hair spring is twisted into the Breguet shape *after* the spring is hardened and tempered.

Therefore, if this unscientific hair spring happened to be of *fine* steel temper, it would have to function under undue stresses.

What does this imply? That, sooner or later, the resiliency of such a spring *must* deteriorate, making the watch an erratic time-piece.

The genius of Waltham overcame this unknown factor of irregularity in the Hair Spring by inventing and patenting a process whereby the whole hair spring was shaped to its ultimate use *and kept in that perfect shape* while being hardened and tempered.

The over-coil called Breguet (after the name of its inventor) was a great invention of years ago, but it affected only the outer half of the spring. And, because of the Waltham scientific method of hardening and tempering in form, it became possible for Waltham to perfect and add an inner terminal bend which gives equal action to both ends of the spring.

This is a vital and exclusive Waltham invention.

It gives to a Waltham Watch a greater dependability and a closer precision. It has made the Waltham Watch the most sought after watch in the world. It gives to the buyer of a Waltham Watch a confidence that herein is the art of watchmaking at its highest development.

Last, but not least — the Waltham Scientific Hair Spring hardened and tempered in form is an *American invention*, exclusively Waltham —

An unanswerable argument why your watch selection should be a Waltham.

Waltham 7½ Ligne

The movement is actually smaller than a dime in diameter

$250 to $1,500 or more depending upon the case

This story is continued in a beautiful booklet in which you will find a liberal watch education. Sent free upon request. Waltham Watch Company, Waltham, Mass.

WALTHAM

THE WORLD'S WATCH OVER TIME

Never Sleep

With a film-coat on your teeth

Millions of people on retiring now combat the film on teeth. They fight it day by day. And those glistening teeth seen everywhere now form one of the results.

You owe yourself a trial of this new teeth-cleaning method. Dentists everywhere advise it. The results it brings are all-important, and they do not come without it.

What film does

Your teeth are coated with a viscous film. Feel it with your tongue. It clings to teeth, enters crevices and stays. And dentists now trace most tooth troubles to it.

The ordinary tooth paste does not end film. So, despite all brushing, much film remains, to cause stain, tartar, germ troubles and decay.

It is the film-coat that discolors, not the teeth. Film is the basis of tartar. It holds food substance which ferments and forms acid. It holds the acid in contact with the teeth to cause decay.

Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea.

Ways to combat it

Dental science, after years of research, has found effective ways to fight film. Able authorities have proved their efficiency. Together they bring, in modern opinion, a new era in teeth cleaning.

These five methods are combined in a dentifrice called Pepsodent—a tooth paste which complies with all the new requirements. And a ten-day tube is now sent free to everyone who asks.

Watch the teeth whiten

You will see and feel results from Pepsodent which brushing never brought you heretofore. A week's use, we think, will amaze you.

One ingredient is pepsin. One multiplies the starch digestant in the saliva, to digest all starch deposits that cling. One multiplies the alkalinity of the saliva to neutralize mouth acids.

Two factors directly attack the film. One of them keeps the teeth so highly polished that film cannot easily cling.

Watch these effects. Send the coupon for a 10-Day Tube. Note how clean the teeth feel after using. Mark the absence of the viscous film. Note how teeth whiten as the film-coat disappears.

The book we send explains all these results. Judge what they mean to you and yours. Cut out the coupon so you won't forget.

Pepsodent PAT. OFF. REG. U. S.

The New-Day Dentifrice

A scientific film combatant combined with two other modern requisites. Now advised by leading dentists everywhere and supplied by all druggists in large tubes.

10-Day Tube Free 484

THE PEPSODENT COMPANY,
Dept. 85, 1104 S. Wabash Ave., Chicago, Ill.
Mail 10-Day Tube of Pepsodent to

.....

.....

.....

Only one tube to a family.

Champion

Dependable Priming Plugs

No Trouble to Start Cold Engines

WHY struggle with a balking cold engine this winter? Save your temper and batteries by quick, sure starting on the coldest mornings.

Get a set of Champion Dependable Priming Plugs. They make speedy work of starting cold engines.

In zero weather, your motor fires instantly with these plugs that introduce the priming gas into the cylinders at the one most effective spot. The gas trickles down the plug core and over the sparking points; exactly where the spark jumps and is hottest.

Champion Spark Plug Company, Toledo, O.

Champion Spark Plug Co., of Canada, Limited, Windsor, Ontario

All dealers sell Champion Dependable Priming Plugs. They cost only $1.50 each. Get this necessary winter equipment today.

MECCANO

Toy Engineering for Boys

WITH Meccano you can build hundreds of fascinating models in shining steel and brass—and, with your dandy Meccano Electric Motor, make them run like real machinery. No study. Follow the simple directions and, before you realize it, you have a wonderful Transporter Bridge, like the one illustrated above. This can be operated by hand or by electric drive. 300 models, just as interesting, are shown in the big Meccano Manual. And, oh, what a thrill of joy it is to invent new ones—what satisfaction to see your own ideas take form in steel and brass! By all means, tell Dad you want Meccano for Christmas.

See These Outfits AT YOUR DEALER'S

No. 0	$ 1.50
No. 1	3.00
No. 1X	5.50
No. 2	6.00
No. 2X	8.50
No. 3	9.00
No. 3X	11.50
Up to	40.00

Electric Motors $3.00 and up.

See the 1X outfit at $5.50. It includes a dandy motor.

Sent prepaid on receipt of price, if not at your dealers.

(X outfits and motors slightly higher in Canada.)

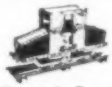
Send for FREE XMAS BOOK

Contains the inventor's entertaining story of Meccano. Illustrated with numerous interesting pictures of models and boys building them. The kind of book a boy likes to get wrapped up in. Just the thing to help you and Dad to pick out your Christmas outfit. Write us your name and address and it will be sent you in the next mail. Get yours good and early.

MECCANO COMPANY, Inc.,

Division H, 71 West 23rd Street, New York City

Beam Engine


Electric Locomotive

Meccano Safe

Donkey Cart

Electric Tractor

The benevolent plot of two kindly old gentlemen

A plot! And against the children of America! Yet judging from the merry faces of Uncle Sam and Santa Claus it bodes no ill.

In fact, they've decided between 'em that American youngsters should have American playthings —and together—for this Christmas —they've made the most splendid things in the whole wide world.

Parents too are conspiring with the two jolly old gentlemen. They know that if little Bobby is to become a *real* American man—and Jane is to become a *real* American woman, the toys they play with two-thirds of the day must be *Real* American Toys.

This Christmas buy American-Made Toys for your children.

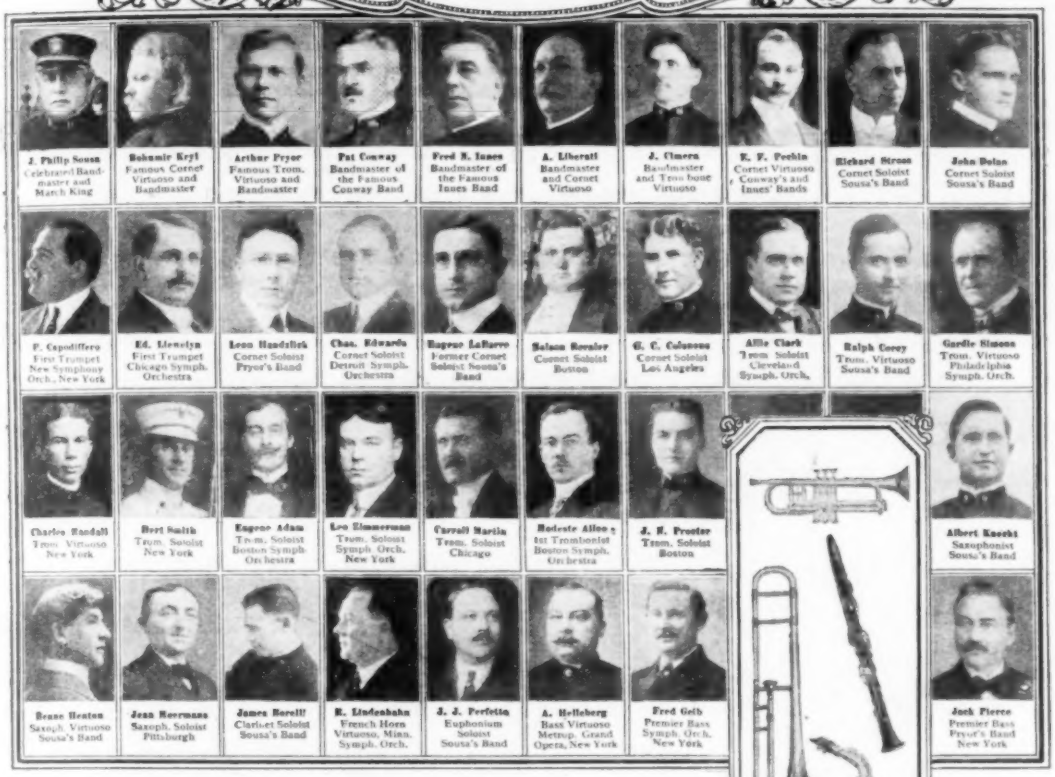
THE TOY MANUFACTURERS
OF THE U. S. A.

FLATIRON BUILDING
NEW YORK

American-Made Toys

Please Mention Popular Mechanics

WORLD FAMOUS MUSICIANS WHO PLAY CONN INSTRUMENTS



Carrying the Cheer of Christmas Through the Year

AFTER all the joyous bustle over gay, mysterious packages comes the silver chime of bells on frosty air; voices raised in song around the glittering Tree. What would Christmas be without its music? How it warms your heart and thrills you with the spirit of good cheer!

That stirring in your heart is the spark of talent. Develop it. Brief practice will open the door to pleasures of which your present appreciation of music is only a foretaste.

The endorsement of world-famous musicians—only a few of whom we can picture here—will be echoed in your own experience when you learn how far a Conn instrument carries you into the pleasures and profits that lie in music.

Golden beauty of tone and remarkable ease of playing —these are Conn qualities, the basis of our supremacy.

FREE BOOK

Send the coupon below for our free book, full of valuable musical information, and describing all band and orchestra instruments. Get details of our free trial and easy payment plan.

A Guarantee Bond with Every Conn

C. G. CONN Ltd
1231 Conn Bldg Elkhart, Ind.

Agencies in all large cities

WORLDS LARGEST MANUFACTURERS OF HIGH GRADE BAND AND ORCHESTRA INSTRUMENTS

All Exclusive Conn Features at No Greater Cost
Awarded Highest Honors at World's Expositions

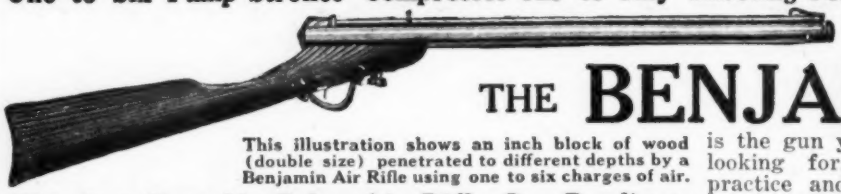
C. G. Conn Ltd.
1231 Conn Bldg.
Elkhart, Indiana

Gentlemen:—Please send me your free book and details of free trial offer of any instrument. (Mention instrument that interests you.)

Name .....
Street or R. R. .....
City or State .....
Instrument .....

UNLIKE ALL OTHERS!

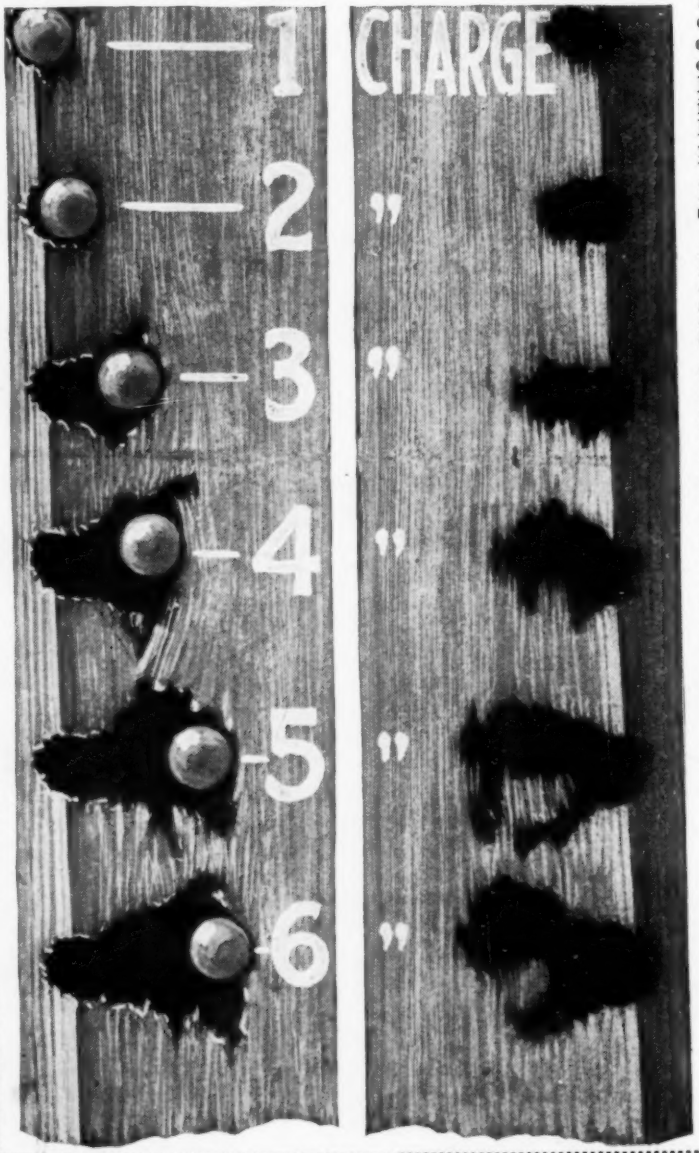
One to Six Pump-Strokes Compresses Air to Any Shooting-Force Desired



THE BENJAMIN

This illustration shows an inch block of wood (double size) penetrated to different depths by a Benjamin Air Rifle using one to six charges of air.

This Is a Feat No Other Air Rifle Can Duplicate



is the gun you have been looking for. For target practice and for hunting rabbits, squirrels, gophers, rats and frogs it has no equal. It is the most powerful, accurate and reliable compressed air rifle made. It has a far greater shooting range than any other. Imagine bringing down rabbits with an air rifle! You can do it with a Benjamin.

The BENJAMIN is the ONLY PUMP GUN MADE using compressed air. It does not lose shooting force after long use. The BENJAMIN is the only air rifle with the shooting force under the operator's control. It can be made to shoot weak or strong as desired, from one to six strokes of the pump giving all the power wanted. It is absolutely safe; accidental discharge is impossible. Furthermore, after being charged with air, it is ready for instant use at any time after the shot is placed in the barrel.

The BENJAMIN is mechanically perfect. It is the only air rifle not requiring frequent repairs, customary in all spring guns.

Price $5.00 Post-Paid

Write for descriptive folder giving full details of this wonderful air rifle.

BENJAMIN
AIR RIFLE & MFG. CO.
615 N. Broadway,
ST. LOUIS, MO., U. S. A.

Pacific Coast Representatives:
McDONALD & LINFORTH,
Call Bldg., San Francisco

WURLITZER

Trade Mark Registered

Free Trial

SEND now for the New Wurlitzer catalog and free trial blank. You may have any musical instrument with a complete musical outfit for a week's trial at home. Return the instrument at our expense at the end of the week if you decide not to keep it.

You will get a complete musical outfit, including the instrument, velvet and plush lined carrying case with lock and key, self instructor, instruction aids, book of music, all attachments and extra parts. Everything at factory cost, a tremendous saving. Wurlitzer supplies the outfit and instrument practically for the cost of the instrument alone.

Convenient Monthly Payments

A few cents a day will pay for your instrument and outfit.

Artistic Quality of Wurlitzer Instruments is known all over the world. Wurlitzer instruments have been the favorites of artists and have been used in the finest orchestras and bands for years. This outfit offer includes genuine Wurlitzer instruments.

Every known musical instrument included in this offer of free trial in your own home. Have your free trial now. We do not charge you a penny for it.

Send for New Catalog and Free Trial Blank

Every instrument known illustrated and described, with price and small payment terms. More pictures and more information about musical instruments than in any other book published. It is a veritable musical encyclopedia. Free trial blank comes with it. Catalog is FREE. There is no obligation. Write for it today.

The Rudolph Wurlitzer Co., Dept. 1779
117 E. 4th Street, Cincinnati, O.
329 S. Wabash Ave., Chicago, Ill.

The Rudolph Wurlitzer Co., Dept. 1779
117 E. 4th St., Cincinnati, O. — 329 S. Wabash Ave., Chicago

Send me your **new catalog** with illustrations in color and full description of the Wurlitzer Complete Outfits and details of the free trial and easy payment offer.

Name.....

Address.....

.....
(State instrument you are specially interested in)

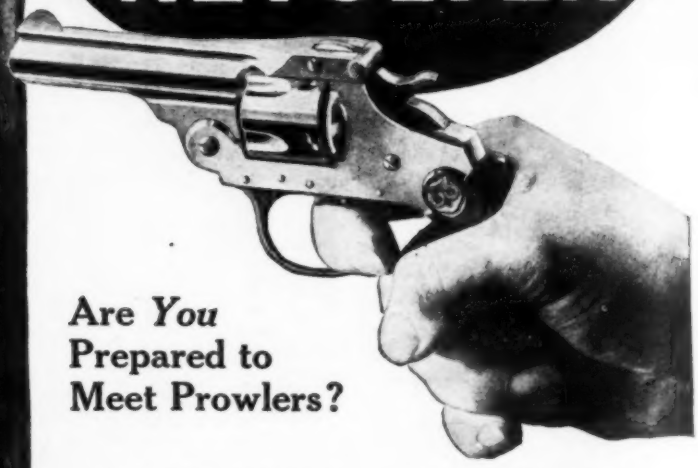
Trade Mark Registered

WURLITZER

200 YEARS OF MUSICAL INSTRUMENT MAKING

Copyright, 1920, The Rudolph Wurlitzer Co.

IVER JOHNSON SAFETY AUTOMATIC REVOLVER



Are *You* Prepared to Meet Prowlers?

"I was returning home late one night and fortunately had an Iver Johnson revolver in my hip pocket.

"Reaching home, I discovered a pair of prowlers attempting to slip out the back way. I gave chase through an alley for two blocks, overhauling one of them, and from that one I learned the name of the other one, whom I interviewed the following day.

"Had I not been armed, I would not have gone up against them."—C. A. HUTSINPILLAR, IRONTON, OHIO.

* * *

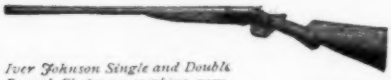
The Iver Johnson is always dependable. And it can't go on by accident. Drop it, thump it, or "Hammer the Hammer." Drawn tempered piano-wire springs throughout make the Iver Johnson alert, ready for use on an instant's notice.

Choice of three grips: Regular, Perfect Rubber, Western Walnut. Three Booklets One or All Free on Request:

"A"—Arms **"B"—Bicycles** **"C"—Motorcycles**

If your dealer hasn't in stock the particular model you want, send us his name and address. We will supply you through him.

IVER JOHNSON'S ARMS & CYCLE WORKS
307 River St., Fitchburg, Mass.
99 Chambers St., New York **717 Market St., San Francisco**



Iver Johnson Single and Double Barrel Shotguns combine accuracy and dependability.

Iver Johnson Bicycles are world-famed for easy riding, strength and durability. Models and prices to suit everyone.

Williams' Shaving Cream

It's all in the lather!

YOU'LL say so, too, when you see in the mirror the reflection of your face smiling from out a great billowy cloud of rich and creamy lather.

Men who use Williams'—and know its thick, softening, velvety lather which won't dry on the face—declare that between it and other shaving creams there is a subtle difference which they can express only by the phrase, "complete shave-satisfaction."

Your choice of four forms

Shaving Cream
Holder-Top Shaving Stick
Shaving Liquid
Shaving Powder

Send 20c in stamps for trial sizes of all four forms, then decide which you prefer. Or send 6c in stamps for any one.

THE J. B. WILLIAMS COMPANY
Dept. A, Glastonbury, Conn.

THE J.B. WILLIAMS COMPANY MAKERS ALSO OF *MATINEE VIOLETS, JERSEY CREAM* AND OTHER TOILET SOAPS, TALC POWDER, DENTAL CREAM ETC.

W. L. Douglas

THE SHOE THAT HOLDS ITS SHAPE

$7.00 $8.00 $9.00 & $10.00 SHOES

FOR MEN AND WOMEN

YOU CAN SAVE MONEY BY WEARING W. L. DOUGLAS SHOES

BOYS' SHOES
$4.50 $5.00 and $5.50

The best known shoes in the world. They are sold in 107 W. L. Douglas stores, direct from the factory to you at only one profit, which guarantees to you the best shoes that can be produced, at the lowest possible cost. W. L. Douglas name and the retail price are stamped on the bottom of all shoes before they leave the factory, which is your protection against unreasonable profits.

W. L. Douglas $9.00 and $10.00 shoes are absolutely the best shoe values for the money in this country. They are made of the best and finest leathers that money can buy. They combine quality, style, workmanship and wearing qualities equal to other makes selling at higher prices. They are the leaders in the fashion centers of America. The stamped price is W.L. Douglas personal guarantee that the shoes are always worth the price paid for them. The prices are the same everywhere; they cost no more in San Francisco than they do in New York.

W. L. Douglas shoes are made by the highest paid, skilled shoemakers, under the direction and supervision of experienced men, all working with an honest determination to make the best shoes for the price that money can buy.

W. L. Douglas shoes are for sale by over 9000 shoe dealers besides our own stores. If your local dealer cannot supply you, take no other make. Order direct from factory. Send for booklet telling how to order shoes by mail, postage free.

CAUTION.—Insist upon having W.L.Douglas shoes. The name and price is plainly stamped on the sole. Be careful to see that it has not been changed or mutilated.

W. L. Douglas

President
W.L.Douglas Shoe Co.,
128 Spark Street,
Brockton, Mass.

ONE BUTTON Hatch UNION SUIT

PATENTED JUNE 15 1914

FOR THE TRAVELING MAN

FOR the traveling man, or the man who's away from home, there's nothing better than the

HATCH
ONE BUTTON
UNION SUIT

Its one master button at the chest does more than insure a perfect fit all over — eliminating all that wrinkling and pulling that a row of nine or more buttons and buttonholes entails. It does away with the trouble and annoyance of making repairs.

With a whole row of buttons and buttonholes, there's usually something missing or something torn when the suit comes back from the laundry. And who is going to keep it in repair for you?

Here, even if the *one* securely fastened button should come loose, there is an extra buttonhole into which an ordinary collar button can be slipped, to do the work until you get back home again.

The Hatch One Button Union Suit comes in the finest of combed cotton materials, and in fine silk trimmed worsted and mercerized garments of all weights.

There are suits for men, boys and misses and we have just added to the line the most recent member of the "One Button Family," a sleeping suit for the kiddies—the simplest, most comfortable sleeping garment ever constructed.

This garment is featured at the best stores everywhere, and if you cannot get it easily and quickly, send your size with your remittance to our mill at Albany and you will be supplied direct, delivery free.

Men's Fall and Winter Suits, $3, $3.50, $4, $4.50, $6, $7, $8
Boys' Fall and Winter Suits, $2 to $2.50
Misses' Fall and Winter Suits, $2.50 to $3
Children's Winter Weight Sleeping Suits, $1.50 to $2

A catalog describing the complete line will be sent free on request

FULD & HATCH KNITTING CO.

Albany *New York*

"Button One **Troubles Done"**

"Help! The ship is sinking." "What do we care? It doesn't belong to us."

Look what's happening to your ship

Yes, it's *yours*. Instead of "ship" read "public utility"—perhaps even the Telephone or Electric Light Company in your town.

Rates at low tide have stranded it on the rocks, while a surging sea of costs for labor and material breaks over it smoke-stack high.

Whether you're a stockholder or not, through investments by your trust company and insurance company you are part owner in the public utilities. So you are protecting your own money when you see to it that they have a high enough rate to keep going.

These public servants are necessary for your safety and convenience, too. For if electric service were forced to shut down, picture the result—

No street cars running. Telephone communication suspended. Factories idle. Homes deprived of electric light. Theatres and "movie" houses closed. Increased fire risk. Streets unsafe at night.

Even now the Electric Light Companies and Telephone Companies are unable to supply service to hundreds of thousands of applicants. Lack of funds stands in the way of adding equipment to extend the lines.

The reasons for such a condition are different in different places, and each case must of course be settled on its merits.

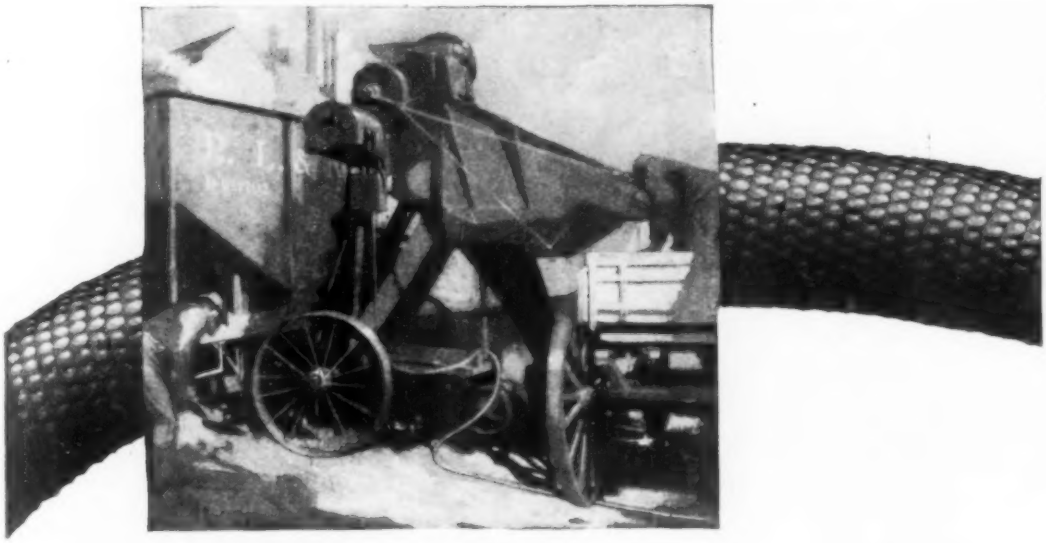
After all, though, it isn't a question of fairness or generosity to the Companies so much as a matter of self-interest to you. "How can I assure myself good electric service?"—that is your problem.

Your law-makers and public service commissioners take their authority from public opinion. And public opinion divided by the population of your community is you.

Published in the interest of Electrical Development by an Institution that will be helped by whatever helps the Industry.

Western Electric Company

No. 18 *Wherever electricity is called on to render its manifold services—in office or home, in city or country—Western Electric, through its 47 branch houses, makes the distribution of electrical products more convenient and more economical.*



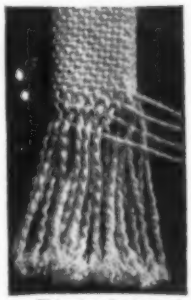
Duracord on portable coal conveyors

PICTURE the wear it gets. Dragged around the yard, run over by heavy wagons, walked on, buried under falling coal—Duracord defies it all.

This sturdy portable electric cord is made for just such service. It has a big thick *woven* fabric covering that accepts its full responsibility and never lays down on the job. It outwears ordinary cord many times.

In addition to portable conveyors, Duracord is used on magnetic cranes, mining machinery, locomotive headlights, cement mixing machines, welders, portable electric tools, extension lamps—wherever the ability to stand hard knocks is an asset.

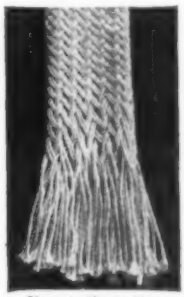
Duracord is made in all sizes of portable electric cord and the larger sizes of single and duplex cable. Ask your electrical jobber or let us send you samples of Duracord and ordinary cord for you to test and compare yourself.



*This is Duracord. Thick, heavy strands, **woven** like a piece of fire hose, not braided. Picture shows outside covering only with impregnating compound removed.*

TUBULAR WOVEN FABRIC CO., Pawtucket, R. I.

Makers of Duraduct
Flexible Non-Metallic Conduit
and tubular woven fabrics of all kinds



Here is the ordinary braided cable covering. Note the open and porous construction, easily cut, stretched or unraveled. Compare it with the illustration of Duracord above.

It pays to put underwear money into "HANES"

—bigger value, longer wear and greater comfort!

HANES

ELASTIC KNIT
UNDERWEAR

Read Hanes Guarantee:

"We guarantee Hanes Underwear absolutely—every thread, stitch and button. We guarantee to return your money or give you a new garment if any seam breaks."

FOR years "Hanes" winter underwear for men has proven itself to be the *national underwear standard;* its sales exceed any elastic knit underwear! Its popularity extends from coast-to-coast!

"Hanes" wins on merit! It is not fancy underwear, but it has enduring quality in its Hanes-spun yarn, in its "Hanes" directed workmanship! And, its warmth, its service and its comfort cannot be exceeded at the price!

Your confidence in every "Hanes" garment, in every "Hanes" thread and stitch can never be misplaced! *"Hanes" guarantee proves that!*

"HANES" underwear is made in heavy and medium winter weight union suits and heavy weight shirts and drawers. The medium weight garment, new this year and illustrated in this advertisement, is of interest to every man who works indoors. It is made of full combed yarn, is silk trimmed and carries the new yellow label.

"Hanes" Union Suits have the tailored collarette that fits closely and will not gap; closed crotch stays closed; an extra gusset gives extra thigh comfort; buttonholes will not stretch and last the life of the garment; pearl buttons sewed on to stay; elastic knit cuffs and ankles hold their shape; flat unbreakable seams. Shirts have the snug fitting "Hanes" elastic knit collarette, and elastic knit wrists. Drawers are cut roomy and have the durable "Hanes" 3-button sateen waist band.

"Hanes" for boys are unmatchable!

Put the boys into "Hanes" Union Suits—the biggest value in quality, wear, warmth and comfort for boys ever sold at the price. These boys' suits duplicate the men's Union Suits in important features with added fleeciness. Made in sizes 20 to 34, covering ages from 2 to 16 years. Two to four year old sizes have drop seat.

Inspect these remarkable "Hanes" garments at your dealer's—at once. If he cannot supply you, write us.

P. H. HANES KNITTING CO., Winston-Salem, N. C. *New York Office 366 Broadway*

Next Summer—You'll want to wear Hanes Nainsook Union Suits!

Warning to the trade: Any garment offered as "Hanes" is a substitute unless it bears the "Hanes" label.

The water swirls through the clothes in a figure 8 motion four times as often as in the ordinary washer.

EVERYTHING can be washed in the 1900, from baby clothes to blankets. The cleansing, soapy water rushes back and forth through the clothes in that magic figure 8 movement, swishing through them with *every motion of the tub!* This figure 8 movement is an exclusive feature.

And there are no parts in the tub to cause wear and tear, or to wrench off buttons. The swinging reversible wringer works electrically, and the entire cost of running the 1900 is only a few cents an hour. When you think of the 1900 remember that magic figure 8!

Write us for the book, GEORGE BRINTON'S WIFE, interesting fiction with some surprising facts included.

1900 CATARACT WASHER

THE 1900 WASHER COMPANY, 205 Clinton St., BINGHAMTON

Canadian Factory and Office: CANADIAN 1900 WASHER CO., 357 Yonge St., Toronto

I'm the figure 8!

Please Mention Popular Mechanics

Chemical Experimenting

Great Fun For Boys and Girls

WITH CHEMCRAFT you can work hundreds of amusing, interesting and instructive chemical experiments with your own chemical laboratory, just like a real chemist. Test food, water, earth and other things; make dyes, soaps and inks; do these and many other useful experiments and learn about chemistry, the wonderful science that tell us what all things are made of. The many marvelous things you can do will keep you interested and fascinated for a long time.

You can puzzle your friends with all kinds of weird, mystifying tricks of chemical magic they'll never understand unless you tell them. Pour three different colored liquids from the same pitcher of clear water; change wine to water and water to wine right before their eyes; make colored chemical fire; chemical ice and snow; magic writing paper; disappearing ink and many other equally queer things. There's no end to the fun you can have, and the correct information which CHEMCRAFT experimenting gives will help you learn chemistry.

Get a CHEMCRAFT outfit this Christmas. Each outfit is a complete chemical laboratory for boys and girls, containing a large assortment of harmless chemicals so each experiment can be repeated many times, all necessary laboratory apparatus and a Manual of Instruction. Be sure and put CHEMCRAFT at the head of your Christmas list.

Sizes for Every Boy and Girl

No. 1—$1.50 No. 2—$3.00 No. 3—$5.00 No. 4—$10.00

West of Denver, Colo., and in Canada, 10% more.

CHEMCRAFT is sold wherever good toys are found. Ask for CHEMCRAFT by name at your store. It's the original and best chemical outfit.

THE PORTER CHEMICAL COMPANY

Porter Products Put Science at Your Service

HAGERSTOWN, MARYLAND

"WHIFF"—the Game of Odors. Greatest fun maker for the whole family; 21 bottles, each containing a well-known odor. Whiff the bottles and guess what's in them. Everyone guesses wrong—that's where the fun comes in! Get "WHIFF" and everyone will have a lot of fun. **Complete Outfit—$1.50**
West of Denver, Colo., and in Canada, 10 per cent more.

"SACHETCRAFT" — the Girls' Sachet Outfit. Contains liberal quantities of lasting, fragrant sachet powder of fine quality, with everything needed to make many different designs of beautiful and useful sachet bags and envelopes. "SachetCraft" will delight any girl. Get one for your sister, or for some other fellow's sister. **Complete Outfit—$1.50**
West of Denver, Colo., and in Canada, 10 per cent more.

STRUCTO TOYS

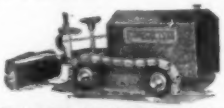
MEN OF BOYS

Building and Racing Structo Toys Is Real Sport!

Ready-Built Toys

Nos. 40, 44 and 48 are ready built for you; ready to run when you get them. Look at these three fine models.

STRUCTO Ready-Built Roadster Auto, No. 40. 10½ inches long. Red, black trimming. Price $3.50.



STRUCTO Ready-Built Caterpillar Tractor No. 44. An accurate duplicate of a well-known farm tractor, 11½ inches long. Separate Disc Harrow included. Green; red and black trimming. Price $5.00.

STRUCTO Ready-Built Caterpillar Whippet Tank, No. 48. Just like a French war tank. Grey, red trimming. Price $6.00.

GET a STRUCTO Auto-Builder Outfit for Christmas and build your own automobile, truck or tractor. Build a racing car, a classy, roadster-type car, a big, strong truck or a dandy farm tractor. Structo Auto-Builder Outfits make it easy to build any of them. It's the next best thing to building a real car! These models have parts like real machines; you assemble the parts like a regular auto mechanic. They run like real machines, too. Some have sliding gear transmission and "big car" differential; others direct-shaft drive with gears on rear axle. All have strong powerful motors and run up hill or on the level.

Building and racing STRUCTO TOYS will keep any fellow busy! It's the greatest sport ever. Each model comes in a box with full directions, ready for assembling. You build it yourself—and then the fun of racing it begins.

Look at these fine models. There are several others, too. See them all at the Toy Department, the Hardware store and any store that sells good toys. Pick the one you want and get it for Christmas. Be sure it's a STRUCTO because that's what you want.

West of Denver, Colo., and in Canada all Prices are slightly higher.

STRUCTO High-Wheel Tractor, No. 11. Big, triple-unit motor; strong and powerful. Trailer included in outfit. Green color. Price $8.50.
Extra Trailers, $1.00 Each

STRUCTO Racing Auto, No. 8, a powerful, speed-demon racing car. 16 inches long. Green enamel, black trimming. Price $6.00.

STRUCTO Bear Cat Auto, No. 10. 16 inches long. Red body. Single unit motor; shaft drive. Price $7.50.

STRUCTO MANUFACTURING COMPANY — FREEPORT, ILLINOIS

VITALIC
TRADE MARK REGISTERED
Bicycle Tires

"Just what I wanted for Christmas!"

TELL Dad you want a set of Vitalic Tires for Christmas—Vitalics last twice as long as other tires. And punctures are almost unknown to boys who ride on Vitalics.

Policemen, letter-carriers, and professional riders know what's what in tires. They use Vitalics. Vitalic Tires are regular equipment on the better-grade bicycles of such makes as Columbia, Dayton, Emblem, Excelsior, Harley Davidson, Indian, Iver Johnson, Miami, Pierce, and Yale.

The price of Vitalics is slightly higher than that of other tires, but the cost is lower—that's because Vitalics give such long and extraordinary mileage. So Vitalics are the least expensive tires.

Read This Inside Information, Fellows

All Vitalic Tires are made with an extra-strong 14½-ounce fabric. The strongest fabric used in most other bicycle tires is 12-ounce—and as a rule bicycle tire fabrics are even lighter. Here is a magnified cross-section of 14½-ounce Vitalic fabric compared with an equally magnified cross-section of 12-ounce fabric.

CONTINENTAL RUBBER WORKS
Erie, Pa.

Export Department
41 Warren St., New York City

TRADE MARK
"Tougher than Elephant Hide"

Where Mechanical Genius has Solved the Problem of LIGHT WEIGHT and DURABILITY

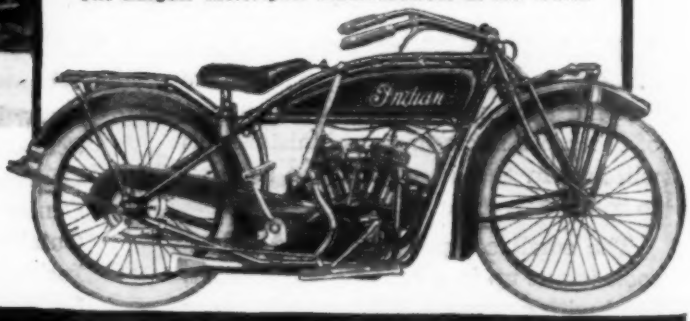
IN THE INDIAN Scout, INDIAN engineers have given to the motorcycle world a powerful, sturdy and compact machine that is extremely light in weight and that has already established itself as one of the wonders of motorcycle development.

But, while light weight was the guiding line of Scout construction, it did not tempt INDIAN engineers to sacrifice durability. In every mechanical member of this newest INDIAN wonder from the unit powerplant with its unusually high horse-power output down to the pressed-steel mudguards, there have been incorporated the same factors of safety that, for years, have made the name Powerplus a by-word for trustworthiness.

Go to your INDIAN dealer today and look over this latest INDIAN marvel. It will appeal to your mechanical sense because it represents the very latest achievement of the world's foremost motorcycle engineers. It will appeal to your sporting sense because it is a thoroughbred.

Hendee Manufacturing Co. Dept. 37 Springfield, Mass.

The Largest Motorcycle Manufacturers in the World



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Indian Motocycle

For Sale by Dealers Everywhere

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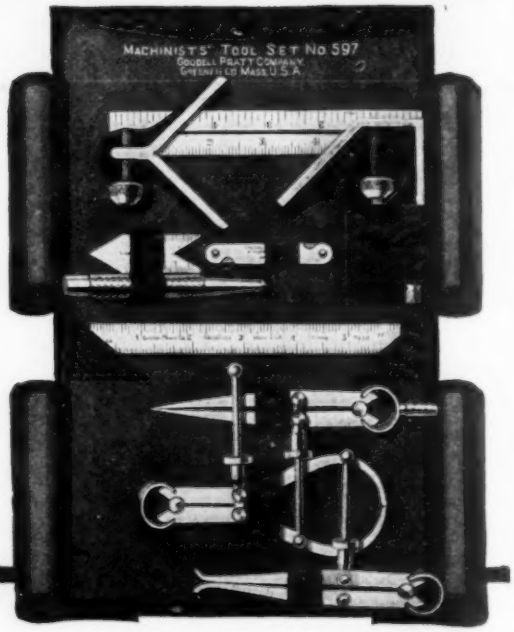
1500 GOOD TOOLS



Machinists' Tool Kit No. 597

YOUNG machinists, students in trade and technical schools, and all others desiring a compact and convenient set of the most necessary machinists' tools will find in this handy set the solution to a long-felt want.

The small compact set of machinists' tools is put up in a genuine leather case, lined with canvas. All the tools are of the finest quality.

The following tools are contained in this set:

- Screw Pitch Gauge
- Semi-Flexible Steel Rule, 6-inch
- Combination Square
- Center Gauge
- Outside Spring Calipers, 4-inch
- Inside Spring Calipers, 4-inch
- Spring Dividers, 4-inch
- Center Punch

Makers of Mr. Punch

This set can also be furnished with tools with metric graduations, or with Whitworth Center and Screw Pitch Gauges.

Write for a complete description, or for a catalogue which shows the 1500 different tools.

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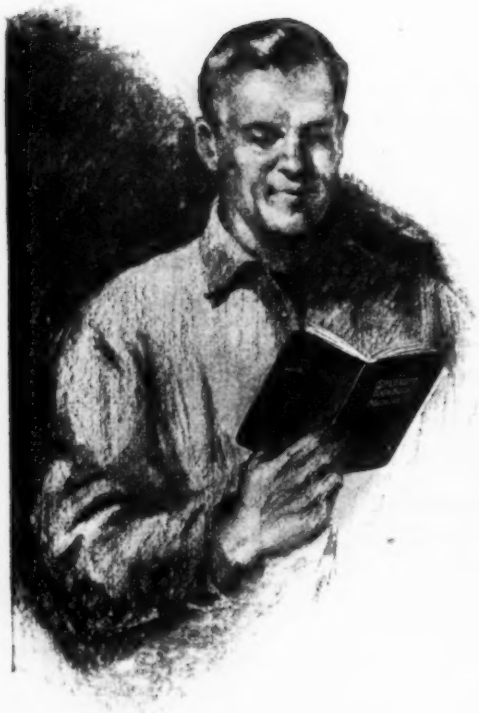

You take your problems to the STARRETT BOOK FOR MACHINISTS' APPRENTICES. It helps you to solve them.

But, if you've completed your time and are a MACHINIST—the old problems no longer puzzle you, but there are new ones that DO.

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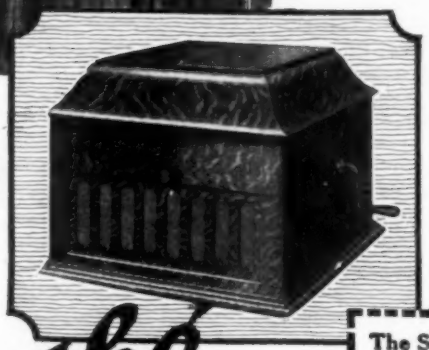

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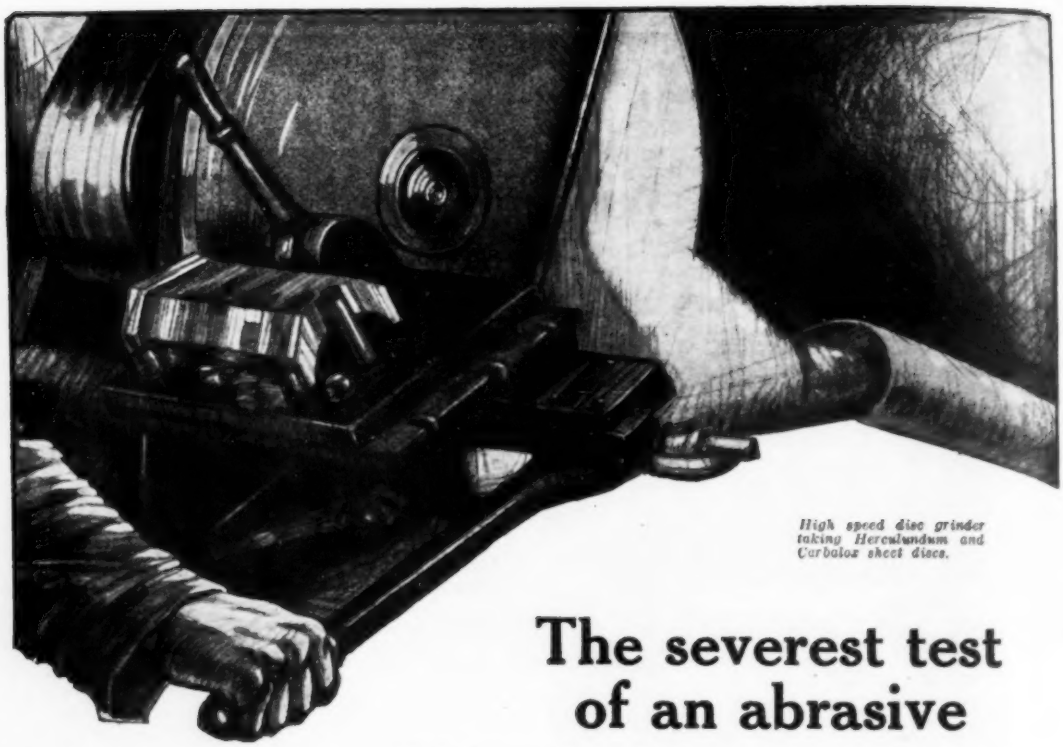

High speed disc grinder taking Herculundum and Carbalox sheet discs.

The severest test of an abrasive

Two thousand revolutions a minute! Whirling along hour after hour! A surface studded with razor-sharp, diamond-hard crystals, ripping, tearing, grinding away at such worthy antagonists as steel, cast iron, brass, etc.!

That is the sort of test for endurance and fast cutting United States discs of *Herculundum* and *Carbalox* are waiting for — to prove their absolute superiority in the world of metal abrasives.

The cutting speed and the long life of United States Sand Paper products ("Map" brand) are not there by accident. Hard and flinty as any abrasive material ever obtained from earth or fiery electric furnace; the particles more accurately sorted and graded; more carefully "laid" and more tenaciously glued to more durable cloth or paper — these are some of the reasons why United States Sand Papers stand ready to measure merit with any line of abrasives no matter what they may be called.

U. S. Fast-Cutting Mineral Abrasives

Flint Paper
Garnet Paper — Garnet Cloth
Emery Paper — Emery Cloth
Crocus Cloth
Carbalox Cloth
Herculundum Cloth

Sheets, Discs, Circles, Belts and Rolls of various widths and lengths of the above U. S. Abrasives.

To Engineers and Purchasing Heads

We're ready to submit all of our story. Ready to study your particular requirements. Ready to stake our claims and recommendations on any sort of a trial order. Ready to take back, if you're not completely satisfied, any unused portion, pay the freight both ways, and allow you full credit for the whole order. Can you beat it?

To the smaller user:

Do you work in wood, metal, leather or composition materials? See your dealer; or write us as to the forms and grades of United States Abrasives best suited to your needs.

Abrasives can't be sharpened —but buying judgment can

United States SAND PAPER

UNITED STATES SAND PAPER CO.
Williamsport, Pa.
Stocks at following Branch Offices
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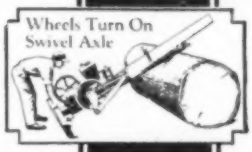
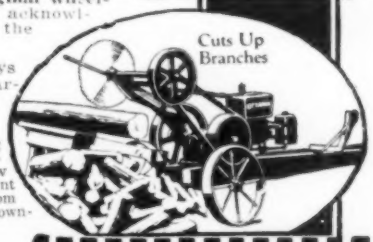
"Look Men— this lever clutch enables me to start and stop saw while the engine is running"

One Man Saws 40 Cords a Day!

Greatest Work-Saver and Money-Maker Ever Invented!

You can, now, cut your entire winter's fuel supply and saw enough wood to sell to your friends and neighbors at a splendid profit. Hundreds of Woodsmen, Farmers and others are making from $10.00 to $25.00 a day with this One-Man Power Outfit. The coal crisis means that wood must be used as fuel and here is your opportunity to make legitimate profits quickly and easily. There never was such a marvel labor-saving machine in use until the OTTAWA was perfected.





Beat the Coal Shortage!

The entire country is facing a most serious condition. Coal is scarce now, but will be scarcer. Any man with standing timber can reap big profits with an OTTAWA LOG SAW. WRITE AT ONCE FOR BIG INTRODUCTORY OFFER. Cash or Easy Terms. Liberal 10 year guarantee.

Shipped on 30 Days' Trial

OTTAWA LOG SAW

Cuts Down Trees—Saws Logs By Power

Pulls Over 4 H-P: Most powerful log saw on the market. **Makes 310 saw cuts a minute.** When not sawing, engine runs your cream separator, corn sheller, grinder, buzz saw, etc. 4-cycle Frost Proof Engine. Oscillating Magneto Ignition—no batteries ever needed. Automatic Governor with Speed Regulator. Always ready to work, and keep on working, zero weather or heat—rain or shine. Special clutch, lever controlled, enables you to stop blade without stopping engine. Uses little fuel. Easily moved. Eccentric gives saw blade human rocking motion, keeping cut free of sawdust. The Ottawa is the **original wheel-mounted one-man** power saw, acknowledged by over 10,000 users as the best logsaw ever **built.**

30 Days Trial—Every OTTAWA shipped on 30 days trial. Must fulfill 10-year OTTAWA Guarantee. For nearly 20 years we have been selling direct from factory to users, saving them thousands and thousands of dollars. Now over 10,000 satisfied users.

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With no obligation to me, please send your Special Offer and Low Factory Price on the Ottawa Log Saw. Also your Free Book.

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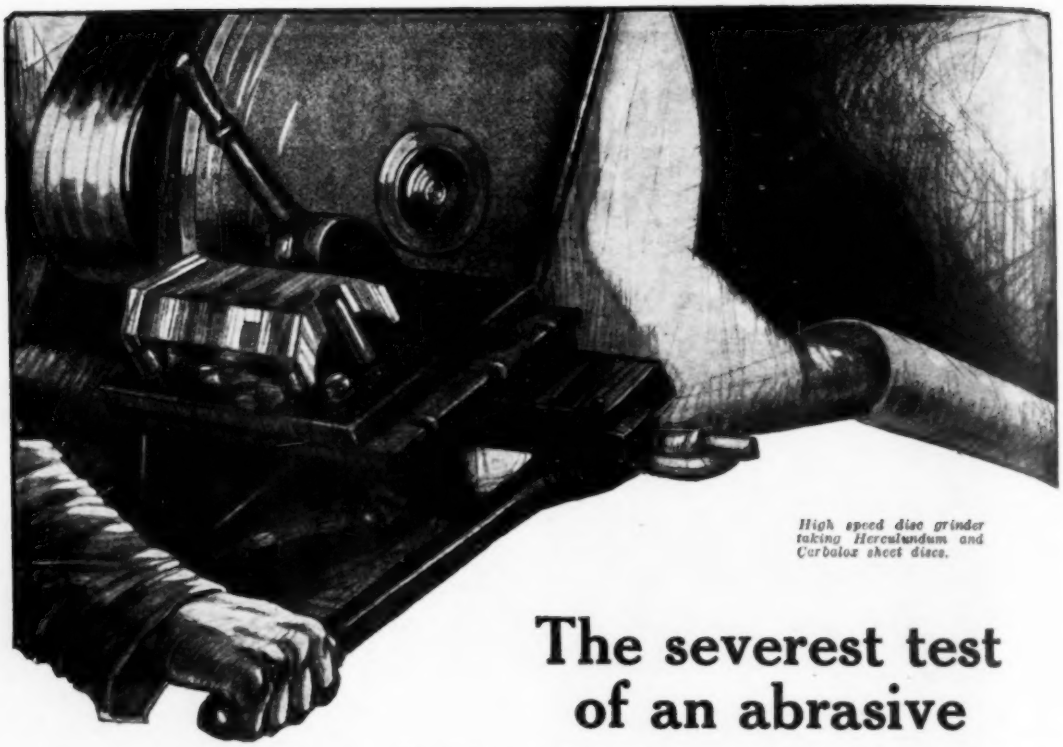

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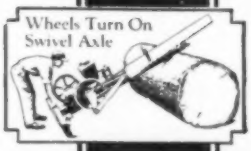

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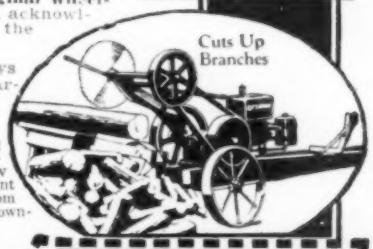

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Outfit consisting of 1 Tree Top Star; 1 box of 48 candles; 1 box Candle Holders; 3 boxes Silver Icicles; 6 Tinsel Ornaments with colored pictures; 3 Red, White and Blue Bells; 12 colored apples; 6 Red Tissue Bells; set of 6 Tissue ornaments; set of 2 Tinsel ornaments; 1 large Tinsel ornament; 6 Red and White Santas.
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Outfit No. 2a1523, a much larger assortment than above. Price **$4.48**
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Made of white net edged with colored cord. FILLED from top to toe with a wealth of toys, games, books, picture cut-outs, and things that kiddies like. Ideal for tree decorations or Sunday School treats. Length 21 inches.
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Pose your victim, make exposure, develop negative and show picture—a long-eared donkey, baboon, or some such ludicrous "likeness." A riot of fun.
No. 2a599 Price 25c
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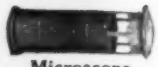

Microscope
This handy microscope magnifies 500 times, revealing many startling facts of the invisible world. Learn the wonders of animal and plant life. This microscope will show you the millions of tiny animals that live and die unseen.
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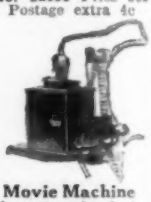

Movie Machine
Uses standard size films and throws five foot pictures. Operated from any electric light socket. All metal, enameled black. Complete with 3 ten foot films and all connections (except lamp).
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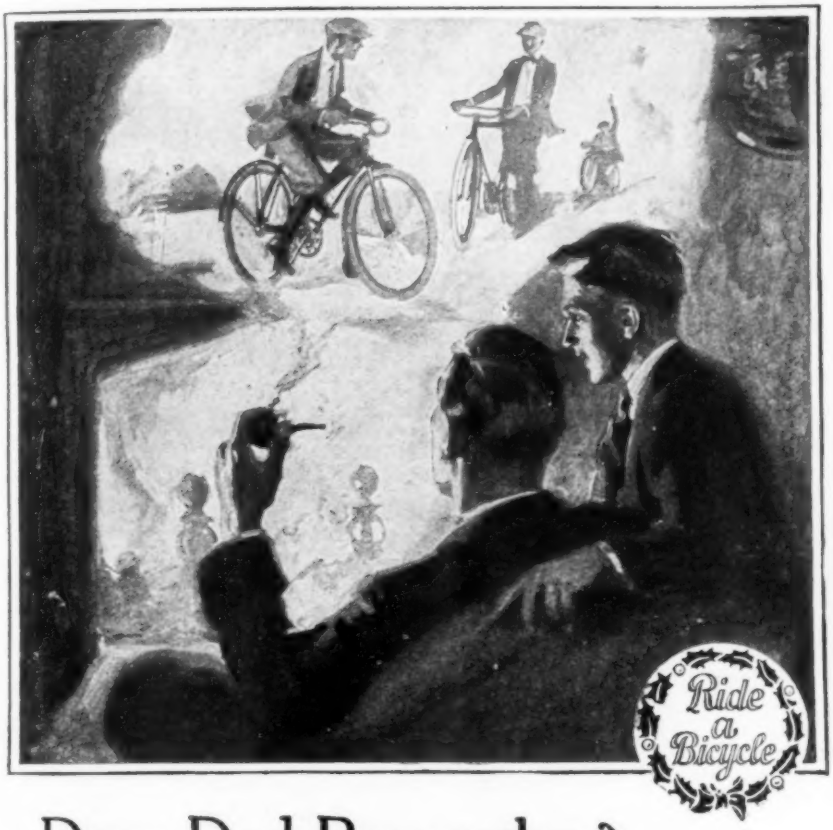
This assortment is made up to meet the needs of the kiddies. Here's the Bubble Blower, the Cum Back, the Hummer, a Horn Pipe, a Roly Poly, a Dancing Ball, and a Magnet.
No. 2a752 Shipping Wt. 10 oz. Price 48c



Does Dad Remember?

If dad will just think back to his boyhood days—if he'll just remember how much *he* wanted a bicycle—and how much fun he had when he actually *got* one—he won't let you be disappointed again *this* Christmas.

THE DAVIS SEWING MACHINE CO. DAVIS MADE DAYTON, OHIO.

We back this Trade-Mark with our Reputation

Good, healthy fun—quick, convenient, economical trips to school or work—wholesome, boyish companionships—*no* boy wants to be "the boy without a bike."

¶ Write today for your dealer's name and copy of handsome new 1921 Dayton Catalog No. 45 showing 8 models for men, women, boys and girls.

Dayton Bicycles

Cycle Division, THE DAVIS SEWING MACHINE CO., *Dayton, Ohio*

The playthings of today make the men of tomorrow

Ives mechanical and electrical trains, and Ives steel boats with their long running motors and screw propellers, will teach you all about the big business of transportation.

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The Ives Manufacturing Corporation

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Ives Toys

Make Happy Boys

For CHRISTMAS!

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The open road and the woods never are so inviting, so exhilarating, on Sundays or holidays, as when a Columbia pilots you.

You never realize how stiff rail and trolley fares are until you buy a Columbia and put those saved sums on its purchase price.

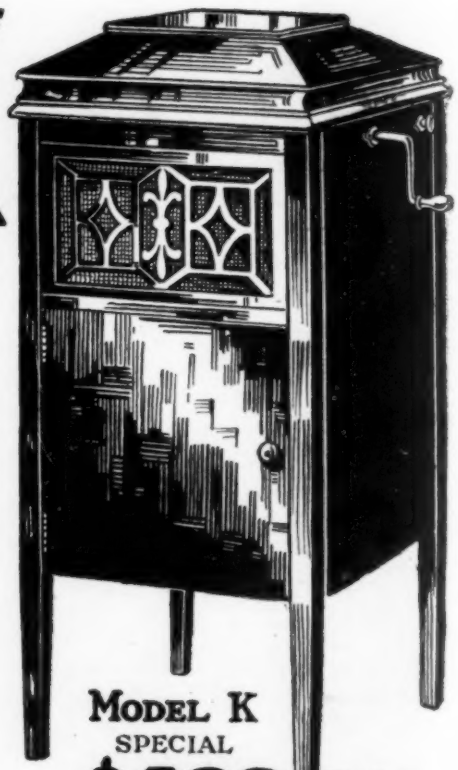
Get that 1921 Columbia *now*. See the various models at your dealer's *today*. Write for a 1921 Columbia Catalog. Ride a bicycle — a *Columbia*. *Live, save, be strong, healthy*—do *your* share towards giving that greater efficiency and promoting that greater production the nation so truly needs. There is a model and a price for every individual preference—for you, for the wife, for the kiddies.

WESTFIELD MANUFACTURING CO.
15 Lozier Avenue Westfield, Mass.

Ride a Bicycle

Columbia BICYCLES

Send No Money



Let Us Send You This SILVERTONE Phonograph for Two Weeks' Trial in Your Home Without Expense to You

WE WANT you to try this beautiful Model K Special SILVERTONE Phonograph in your own home for two weeks without a cent of expense and without obligating you to buy if you are not fully satisfied with the instrument.

Fill in the order blank and mail it to Sears, Roebuck and Co. today. We will ship the phonograph on two weeks' trial. You take absolutely no risk, nor do you obligate yourself in any way by taking the SILVERTONE on trial. All we ask you to do is to give the phonograph a thorough test. Examine its mechanical features, cabinet work and finish. Try it with any disc record you desire, and note its beauty of tone and fidelity of reproduction. Give it every test necessary to prove the truth of our claims for it. And then compare the price of the SILVERTONE with that of any other phonograph of the same size, beauty and musical excellence.

If, at the end of two weeks' trial, you are not fully satisfied with the SILVERTONE, if you do not believe that it is in every way the equal of any phonograph on the market selling at prices from 25 to 50 per cent higher than the SILVERTONE, simply notify us and we will take away the phonograph at our expense and will return any transportation and cartage charges you have paid.

Play as You Pay—Very Easy Terms

If, after two weeks' trial, you are fully satisfied with the SILVERTONE and desire to keep it, simply send us the first monthly payment of **$4.00** and then the same amount each month until the total is paid.

Compare our terms with those offered on any other phonograph of the same high quality. The small monthly payment required makes it easy for you to own a really fine instrument without incurring a heavy financial burden.

This Liberal Selling Plan Is the Best Guarantee of SILVERTONE Quality

We know that the SILVERTONE Phonograph is right in every respect—mechanically, musically and in design and finish. That is why we can offer them on this liberal no money down trial basis. We know that when you have seen and played the SILVERTONE Phonograph you will agree with us that it is the best phonograph on the market at anywhere near the same price.

Plays All Disc Records

The SILVERTONE convertible tone arm is so constructed that it permits the playing of any make of disc record, either vertical or lateral cut. It is almost as easy to adjust the reproducer for different types of records as it is to change needles.

MODEL K
SPECIAL

$4.00 A Month

Price $79.00

Quarter Sawed Fumed Oak

This beautiful cabinet is made of genuine quarter sawed oak in the popular dull fumed finish. The design is simple, yet graceful and dignified. It is 42¼ inches high, 21½ inches deep and 18¼ inches wide, a size admirably adapted to the average living room. All visible metal parts heavily nickel plated and polished. An assortment of needles included.

Sears, Roebuck and Co.
Chicago · Philadelphia · Seattle · Dallas

Sears, Roebuck and Co. (Mail to Nearest Store.) 80P90 Date_____192__

Ship me the Model K SILVERTONE, price **$79.00**, for two weeks' trial. If after two weeks' trial I decide to keep and use it, I will send **$4.00** as first payment and pay balance at the rate of **$4.00** monthly until paid in full; then the SILVERTONE becomes my property. If I decide after two weeks' trial that the SILVERTONE is not satisfactory, I will notify you and you are to give instructions for returning it at your expense, and refund any money I have spent. I have always been faithful in paying my obligations and am making this statement for the purpose of inducing you to grant me these terms. I give you my pledge that you may feel safe in trusting me to pay as agreed.

Sign Here ☞ _____
(If under age have some responsible member of your family sign with you.)

R.F.D. No._____ **Box No.**_____ **Street and No.**_____

Postoffice_____ **County**_____ **State**_____

Shipping Point_____ **County**_____ **State**_____

I have been located in this town since_____ **If less than five years, give former address**_____ **Do you wish shipment made by express or freight?**_____ (State which)

Name of HEAD OF HOUSEHOLD_____ **Business or occupation**_____

(Please give Names of TWO References.)

Name	Address	Business or Occupation

Throw Your Switch!

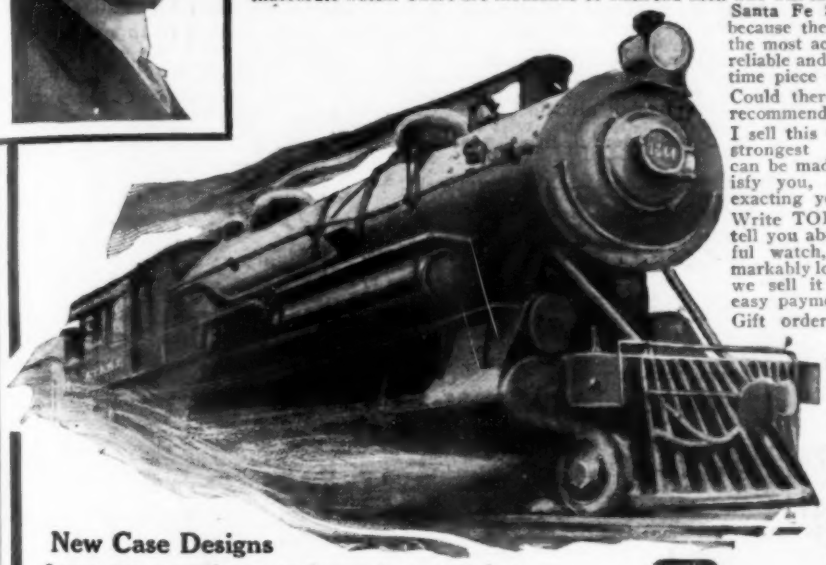
And when you get on the Main Line with a SANTA FE SPECIAL in your pocket you leave worry on the siding. This wonderful watch is made especially for Railroad Men, the most exacting watch owners in the world. A Railroad Man who holds an important position, or who hopes to be promoted to one, would rather try to tell time by the sun than by an inaccurate watch. There are thousands of Railroad Men who will carry nothing but a **Santa Fe Special.** This is because they have found it the most accurate, the most reliable and the most durable time piece money can buy.

Could there be a stronger recommendation?

I sell this watch under the strongest guarantee that can be made. It must satisfy you, no matter how exacting you are.

Write TODAY and let us tell you about this wonderful watch, about the remarkably low price at which we sell it and about our easy payment plan.

Gift orders given special attention.



HON. CHAMP CLARK, House of Representatives, Washington, D. C.
"I have carried a 'Santa Fe Special' for three or four years and find it to be an admirable time-piece."
CHAMP CLARK.

New Case Designs

I want you to see the newest designs in cases used on these "Santa Fe Special" Watches, so you will fully realize their beauty and up-to-dateness, as well as the value of the Bargain I am offering you. I want you to see the 3-color inlay work—think how distinctive and personal Your Watch would be with your own name, monogram or some appropriate emblem engraved in the case, just to suit your own ideas. You will also want to see the new French Art designs in engraved cases—all shown in My New Free Watch Book, printed in beautiful colors.

The ILLINOIS Famous $ Santa Fe Special 21 JEWEL RAILROAD WATCH 3.50 A MONTH

The Standard Railroad Watch that is GUARANTEED FOR A LIFETIME OF SATISFACTORY SERVICE. These watches are now in service on practically every railroad in the United States and in every branch of the Army and Naval service. Thousands of them are distributed around the world. Your name or monogram and any emblem you may desire, will be engraved in the case to suit your own ideas. Write today for my Free Watch Book—make your selection.

Save One-Third to One-Half of Your Money—Most Liberal Offer Ever Made.

Our "Direct-to-you" low wholesale terms and Extra Special Distribution Plan is fully explained in the New Santa Fe Special booklet just off the press. The "Santa Fe Special" Plan means a big saving of money to you and you get the best watch value on the market today. Watch sent for you to see without one penny down.

Santa Fe Watch Co.

Dept. C-6, Thomas Bldg.,

TOPEKA, KAN.

(Home of the Great Santa Fe Railway)

A letter, post card or this coupon will bring my Beautiful Watch Book FREE

SANTA FE WATCH COMPANY,
Dept. C-6, Thomas Bldg., Topeka, Kans.
Please send me your New Watch Book with the understanding that this request does not obligate me in any way.

Name .....

Address .....

State .....

Be a Movie King

OH BOY! SOME SPORT

Surprise the Bunch—Have a Barrel O' Fun

Own a Genuine Moving Picture Machine

Here's what you've always wanted—a genuine MOVING PICTURE MACHINE—a machine that uses STANDARD FILM—like the Big theatres show—at a price you can easily afford to pay. This is the BIG opportunity—don't MISS it. Read every word, then act quick. Three swell models to select from. Each the best of its kind. All REAL moving picture machines—not toys or magic lanterns, but REAL Movie Machines, that show the pictures on the screen. The Films are supplied to us by the leading film companies in America, and the subjects include all the LEADING actors and actresses that you see and admire in all the big theatres. The "fellers" and girls and the grown-ups, too, will sit spellbound, or roar with laughter at the wonderful, lifelike, real movies you can show them.

Three-Reel Cinematograph

Here is an astonishing bargain. Our latest Model Cinematograph is a whirlwind value. At the price it has everything beat you ever heard of. Here is a genuine Moving Picture Machine, made entirely of metal, solidly constructed, and put together by expert workmen, that you can buy at a price that will simply astound you. It comes equipped with a SAFETY CARBIDE Gas Generator, and can be used to show moving pictures anywhere. The mechanism is so simple it can be operated by anyone. The greatest value in a Genuine Moving Picture Machine ever offered at the price. Think of it! A genuine Moving Picture Machine, using STANDARD FILMS, shipped by express, charges collect, with 3 REELS FREE, for ONLY $3.00; or shipped by parcel post to any address in the world prepaid for $3.25.

New Model Movie Machine

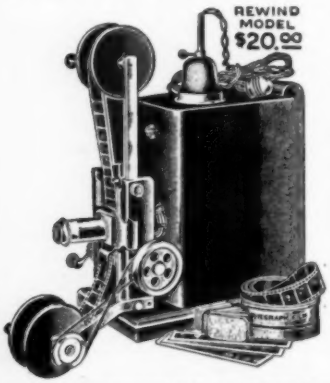
Your Choice of Gas or Electric Light

This is a beautiful, high-class Moving Picture Machine. Made of sheet iron with wood base. Finished in black or battleship grey with handsome red stripe trimmings. Solid and substantial construction. Size 12x7½x5½ in. Uses STANDARD FILM same as the big machines. TWO TYPES—Electric and Gas. The electric machine is equipped with plug and cord complete, ready to attach to any electric light socket. Gas machine has its own generator and makes its own light. The gas machine can be used anywhere and will be sent unless electric type machine is specially ordered. Sent securely packed in special shipping case with full instructions, film, supply of show tickets, etc., for $7.50, by express, or $8.00 if sent by prepaid parcel post.

Keystone Moviegraph

Moving Picture and Magic Lantern Combined

A regular beauty, all complete, ready for you to use the minute it arrives. Hang up a sheet, put on a reel, turn the crank, and you're off. That's all there is to it. Made of metal throughout, with heavy base casting. Finely adjusted mechanism, easily operated. Electric model only; simply screw in plug to your electric light socket and you are all ready for an exhibit. Equipped to show slides as well as Real Moving Pictures—just like the big machines. 12x9½x6 in. Comes with 3 EXTRA LONG STANDARD SIZED FILMS, 3 FINE LANTERN SLIDES, and admission tickets—all FREE. A machine you will be proud of. You can have endless fun and amusement, and MAKE MONEY with it. Sent by express, with full instructions and extra long cord and plug, securely packed, for $12.00; or by parcel post, to any address in the world, for 75c extra.



No. 2 Rewind Model

Largest and Most Powerful Model

This is the No. 2 Rewind Model, with equipment for unwinding and rewinding 100 to 200 feet of film. The size of the machine is 6¾ x 14 x 19 inches. It is constructed on a wooden base 6¾ x 11½ inches, which will not scratch the furniture. Electric model only, it operates from any electric lighting circuit. All you have to do is to screw in plug to any electric light socket. It has a regulator so that different sized lamps may be used—electric socket, plug and six feet electric lamp wire cord, and nickelled reflector. Also shows magic lantern slides. With this machine we furnish a can of 100 feet of film, three American-made Lantern Slides—subjects of which are Wilson, Pershing, Aeroplanes, Boy Scouts, Charlie Chaplin, Jiggs, Comics, etc., 100 Theatre Tickets, guarantee and full directions. **PRICE $20.00**, shipped by Express, or by prepaid parcel post to any address in the world for $1.00 extra.

Extra Films

EXTRA FILMS. For all our Machines. Big variety of subjects, including leading and best known movie actors and actresses. Standard size. **Short Reels, Price** 15 cents each. **Extra Long** (5 feet), **Price** 3 for $1.00. **Special 100-feet reels** $2.50 each. CHARLIE CHAPLIN FILMS, 25c each; 5-foot lengths, 60c each. All postpaid.

LANTERN SLIDES for Keystone Moviegraph, American made, 6 for 75 cents.

"U-MAK-EM" SLIDES. A special slide for use with the $12.00 and $20.00 machine or any other machine with Lantern Slide equipment, for showing on the screen announcements such as "Please Remove Your Hat," "No Smoking," "Intermission," "Goodnight," sporting results and even advertisements, etc. Can be used repeatedly. **PRICE** 3 for 50 cents postpaid.

JOHNSON SMITH & CO., Dept. P.M. 33, 3224 N. HALSTED ST., CHICAGO

Electrical "Made in America American Flyer" Mechanical

"The Train with the Guarantee" MINIATURE RAILROADS — Registered U.S. Patent Office

"AMERICAN FLYER" equipment is so much like the real thing on electric and steam railroads, that several big engineering schools use "American Flyer" systems to teach the principles of signal engineering. In fact, they have everything that a real railroad has—tunnels, bridges, switches, stations, signal towers, sidings, brakes, engines, tenders, freight, mail and passengers cars—complete in every detail.

Electrical trains run by real electricity, which you turn on and off as you please. Mechanical trains run by spring mechanism.

Ask any toy dealer

to show you the "American Flyer." You can get one or both trains and any amount of track, etc., that you wish, and add to it with more units. It comes in "sections." Over 2,500,000 American boys own our trains now. They get real fun from them and also learn a lot about the practical wonders of electricity and the fascinating business of railroading.

Tell dad about it

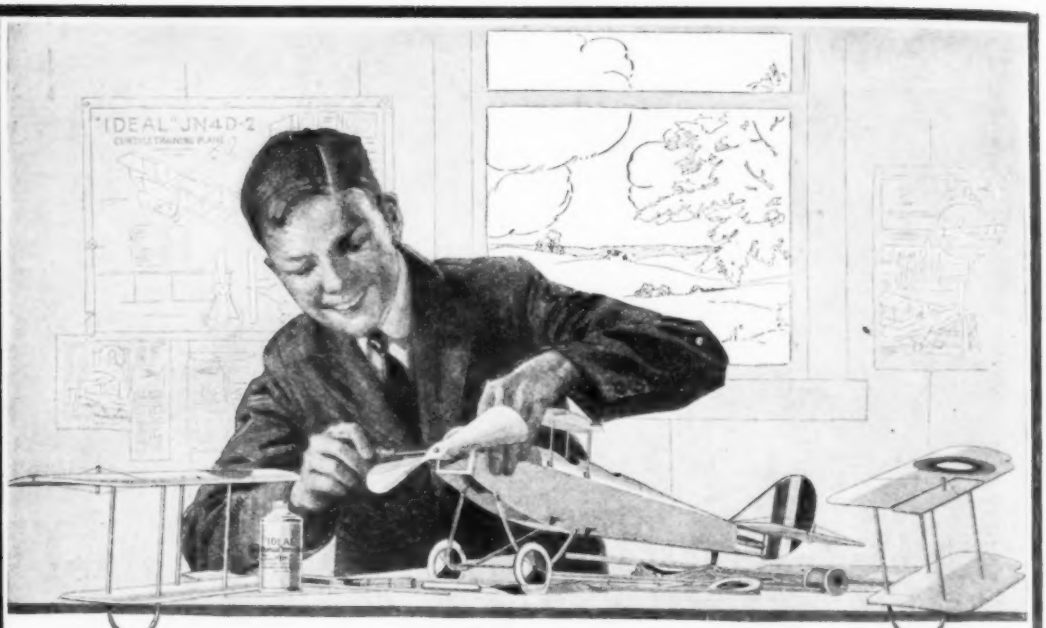
He will see that an "American Flyer" train is the best and most useful thing he can get you. And when you come to lay out the track together and talk about it, you will get to be greater pals than ever.

If you can't find an "American Flyer" train in any toy store, send us the name of the store and we will send you a folder telling you all about the finest toy train in the world—the "American Flyer."

AMERICAN FLYER MFG. CO.

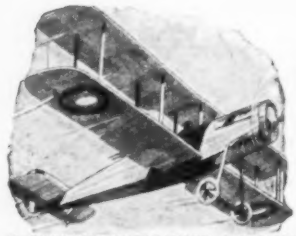
2219-39 S. Halsted St., Chicago, Ill.

Makers of a complete line of electrical and mechanical trains

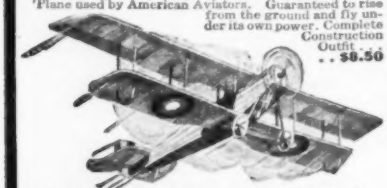


Building and Flying Model Aeroplanes

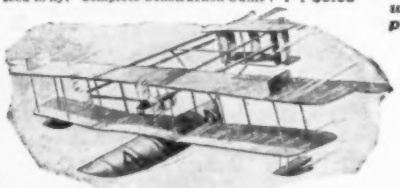
Real Fun for Live Boys!



DeHAVILAND BATTLE PLANE, 3-ft. Model
An exact duplicate, 1-14 actual size of the famous Battle 'Plane used by American Aviators. Guaranteed to rise from the ground and fly under its own power. Complete Construction Outfit **$8.50**



CURTISS JN4D-2 Training 'Plane, 3-ft. Model
A perfect model of the machine used for training purposes and most frequently seen in the air now. Guaranteed to fly. Complete Construction Outfit . . . **$8.00**



N C 4 NAVAL-CURTISS SEAPLANE, 4 1-2 ft. Model
A faithful copy of the celebrated 'plane that flew across the Atlantic Ocean. Guaranteed to rise from the water and fly in the air. Complete Construction Outfit **$10.00**
CURTISS MILITARY TRACTOR, 3-ft. Model. The Biplane most frequently copied in aeroplane design. Has many features of real machine. Guaranteed to fly. Complete Construction Outfit **$7.50**
NIEUPORT MONOPLANE, 3-ft. Model. One of the leading French Scout 'Planes and an especially attractive type. Guaranteed to fly. Complete Construction Outfit. **$7.00**
BLERIOT MONOPLANE, 3-ft. Model. This is an exact model 1-10 actual size, of the Bleriot XI, the first machine to fly across the English Channel. Guaranteed to fly. Complete Construction Outfit **$6.00**
TAUBE MONOPLANE, 3-ft. Model. A copy of the German and Austrian "Dove like" machines. A remarkably good flyer. Complete Construction Outfit **$6.00**
CECIL PEOLI RACER. The American record-breaking Racing Aeroplane. 3-ft. size. Guaranteed to fly 800 feet. Complete Construction Outfit, ready to build **$5.00**

Building a Model Aeroplane is the most interesting work you ever tackled. It develops your mechanical ability, keeps you busy and fascinated all the time and shows you how big aeroplanes are constructed. Building a Model Aeroplane that will fly is something you can be proud of, too, because when you build it yourself you will have a finished model that would cost $50.00 if you could buy it ready built.

Any handy boy can build one. IDEAL Model Aeroplane Construction Outfits make it easy. These Outfits contain everything needed to build the complete Aeroplane; including Complete Plans, with Scale Drawings and Building and Flying Instructions.

Build your own Model Aeroplane. Then fly it like a real aeroplane. All IDEAL Model Aeroplanes are guaranteed to fly when correctly built. They rise from the ground or water under their own power and fly in the air. Decide now that you're going to have an IDEAL Model Aeroplane for Christmas. Read the specifications for each different type at the left and pick the one you're going to get.

All IDEAL Model Aeroplanes are **GUARANTEED** to fly when accompanying Building and Flying directions are followed carefully.

They are sold by the Leading Toy, Sporting Goods and Department Stores. ASK FOR THEM AT YOUR STORE. If you cannot get what you want, we will fill your order direct by mail, postpaid at prices listed in this advertisement.

See Page 193 for Our Advertisement of IDEAL Racing Aeroplanes and Flying Toys

Plans for Model Aeroplanes

Complete Plans, which include Scale Drawings and Building and Flying Instructions, for any of the above Model Aeroplanes sent postpaid for 35 cents. They show what is required to build a 3-ft. Model Aeroplane, and how to build it.

Send for Our New 1921 Aeroplane Catalogue

Gives full descriptions of all IDEAL Model Aeroplanes and Flying Toys. Also lists hundreds of Model Aeroplane parts and fittings. It's a book every Amateur Aviator should have. **Sent postpaid for 5 cents. Send for yours now!**

Ideal Aeroplane & Supply Company

Making Model Aeroplanes Since 1911

159 Wooster Street, Cor. West Houston Street
NEW YORK CITY

West of Denver, Colo., and in Canada 50c additional for each outfit.

AMERICAN TOYS

Make Money Building Choraleon Phonographs

You can do it easily and have a lot of fun, too. Build one for yourself and then for your neighbors and friends. Here's Charles Leaderer of Goshen, Indiana, at the left working merrily away. Down in the lower right hand corner Mr. Chris. Kusenstrintz is trying out his latest model. In the other corner Mr. F. L. Claire of Lewiston, Me., is standing beside a beautiful Choraleon he made, with special inlaid work. Mr. Lawrence Hansen of Gibson City, Ill., in the center has just finished a beauty. Read what some of our customers have to say elsewhere on this page.

Make $50 to $175 on Each One You Build

We furnish plans, blue prints, motors, tone arms, case material—everything required, and full instructions. Of course, being mechanically inclined, it will be the easiest thing in the world for you to build these phonographs.

CHORALEON PHONOGRAPHS are unsurpassed in tone. They play any record. You can't tell them from the highest priced phonographs. Everything guaranteed.

We have been running small ads in Popular Mechanics for three years. Maybe you missed them because they were small. But many others have seen them and many are now building phonographs and making money. If you want to while away some pleasant hours and make some big money, write today for free particulars.

Choraleon Phonograph Co.
1220 1st St.
Elkhart, Ind.

Isn't This Convincing?

430 Charlton Ave.
Hamilton, Ont., Canada

Choraleon Phonograph Co.,
Elkhart, Ind.

Dear Sirs:—Please send me one of your circulars entitled, "How to Build Your Own Phonograph," as I would like to make one. Mr. Gallie, 339 Wentworth street, has built one and installed one of your motors and tonearms, and if he hadn't told me that he had made it himself I would have taken it for a $150.00 model.

Yours very truly,
F. C. STRONG.

36 Mescott St., Jamestown, N. Y.
Choraleon Phonograph Co.,
Elkhart, Ind.

Gentlemen:—I have my Choraleon all finished now and I am well pleased with it. Every one who has heard it says it sounds just as good as a $200.00 one. I wouldn't sell mine for that.

Yours truly,
EDWIN JOHNSON.

143 Pacific St., Paterson, N. J.
Choraleon Phonograph Co.,
Elkhart, Ind.

Dear Sirs: — We are perfectly satisfied with the machine, and everyone who hears it says it is as clear as any machine they ever heard. We are playing it every night and having lots of enjoyment with it. I have orders for two machines the same as mine. Yours truly,
C. H. BULTMAN.

They work naturally and form no habit

They work naturally and form no habit

They work naturally and form no habit

They work naturally and form no habit

At the 10,000
Rexall
Stores only
8 for 10¢
24 for 25¢
60 for 50¢

Please Mention Popular Mechanics

You Can Make $300 in 30 Days During your spare Time

If you want to add $10 a day to your income, this is your opportunity. I will pay you $300 a month for taking a few orders each day for Comer raincoats. Experience is not necessary. No capital is needed. My splendid new line of models and fabrics is now ready. Thousands of people in all parts of the United States are ready to buy. And I offer to pay you from $50 to $100 a week for a little of your spare time.

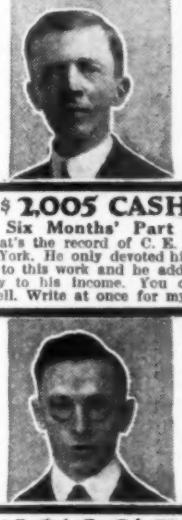
$100 a Week is McCrary's Record

Last year I paid McCrary a net profit of $5,218. He often makes from $20 to $40 in a single day, and he only works a few hours each day. And you can make just as much or more than he does. Your income can be bigger than a banker's, lawyer's, merchant's or doctor's. Millions of dollars are going to be spent within the next few months for raincoats. Thousands of orders are waiting for someone to come and get them. I want you to help in getting these orders.

Think what an opportunity this is. George Garon of Massachusetts just wrote: "Yesterday morning I started on a new job, and in the evening I found I had made about $40 commission. I think that's a pretty good start."

You don't have to be a smooth-tongued salesman. Comer raincoats are all high-grade and wonderfully attractive in style and fabric. The prices are so exceedingly low that they sell on sight. Every man, woman and child needs a raincoat.

We also give our representatives the agency for our waterproof aprons and raincapes. On every call there is the opportunity to make from $2.00 to $20.00 net profit for yourself. If you take only three average orders a day during your spare time you will make $2,500 a year. Many of our agents make twice that much.



$2,005 CASH for Six Months' Part Time

That's the record of C. E. Ray of New York. He only devoted his spare time to this work and he added $13 a day to his income. You can do as well. Write at once for my offer.

$1,060 CASH for Three Months' Spare Time

A few hours now and then devoted to this proposition gave Carl Rowe a net profit in three months of over a thousand dollars. I offer you the same proposition.

I Tell You Where to Go, What to Say and How to Make Money

We manufacture our own coats. The Comer Manufacturing Company is the largest business of its kind in the world. We stand back of our agents. We help you. We show you exactly what to do in order to make big profits for yourself. We furnish everything and we finance you. That is why A. McDonough of Washington made $1,509 in three months and Barnes cleared $523 in thirty days.

I Furnish Full Equipment

I will furnish you with dozens of samples of materials and everything you need to start this prosperous and profitable business. If A. N. Weckerly of Ohio made $74 in four days' spare time, and Cooper averages $4,000 a year, think what an opportunity this presents to you.

I Offer Thousands of Dollars in Cash

Mail the coupon, and I will tell you how you can earn big cash prizes, in addition to your regular commissions and income. The Comer plan makes it possible and easy for you to make an extra hundred dollars the second month you work for me. It doesn't cost you a cent to get started, so act now.

I want you to understand that a Comer agent makes real profit. You get the cash, and you get it right away. There is no waiting, no delay, no delivering and no collecting. If you have confidence in yourself there is no limit to what you can make.

NOW—GET STARTED

Don't send any money. I want you to simply mail the coupon and I will send you all the details of this wonderful proposition. It is actually worth thousands of dollars to you. People are buying raincoats by the thousand. There is no chance of failure. Hundreds are successful, and you can be just as successful as any of them. Just write your name and address on this coupon with a pen or pencil, tear it off and mail at once. Act right now.

THE COMER MFG. CO.
Dept. U-136, Dayton, O.

MAIL THIS COUPON

The Comer Mfg. Co.,
Dept. U-136 Dayton, Ohio

Please tell me how, without investing any money, I can become your agent and make from $50 to $100 a week. Also send me, without charge, your offer of a raincoat for myself.

Name.....

Address.....

P. O.....State.....

What does He want for Christmas?

Now is the time to be thinking of those little gifts which make Christmas a day of gladness and good-will.

For a useful gift to the mechanic or the technical student home for the holidays what could be more appropriate than a good tool?

Your dealer carries Brown & Sharpe Tools. Ask to see the line of Micrometer Calipers in Morocco Gift Cases. Note the fine finish and remember that seventy years' experience guarantees their accuracy.

If your dealer cannot supply you, we'll be glad to send Catalog No. 28.

BROWN & SHARPE MFG. CO.
Providence R.I. U.S.A.

AGENTS: We Pay $12 a Day

Taking Orders for 2 in 1 Reversible Raincoats

One side dress coat, other side storm coat. Tailored seams, sewed and strapped. Brand new. First season. Not sold in stores. We control the entire output. Take orders from men and women who object to paying present high prices.

Positively Guaranteed Waterproof

or money back. Our men and women representatives having wonderful success. Right now is the big season. No experience or capital needed. **You take two average orders a day and we will mail you commission check for $12.** We are paying thousands of dollars to our agents taking orders for this new Reversible Coat. We have all of the latest and best styles of raincoats for men, women and children. Our new, big swatch book, 48 pages, shows all new and distinct patterns. Write today for agency and sample coat and be first in your territory to introduce this new big seller.

PARKER MFG. CO., 778 Storm Street **Dayton, Ohio**

Actual Photo of One of Our Rebuilt Underwood Typewriters

$5.00 DOWN Brings You This Standard Underwood Typewriter

Yes, only $5.00 down brings you this Standard Visible Writing Underwood, factory rebuilt from start to finish like new, just like the picture above. Then only a little monthly while you are using it makes it yours. New genuine Underwood parts wherever the wear comes—thoroughly tested—guaranteed for five years. Our supply is limited. At our exceedingly low price and on our liberal terms, these will go with a rush—so act now while this easy payment bargain offer is open.

5-YEAR GUARANTEE

You run no risk, for we absolutely guarantee every one of our genuine factory rebuilt Underwoods for five years. This guarantee is sent right with the machine. It means the Underwood you get must be exactly as illustrated and described herein and that it will give you five full years of service. It means, too, that only an expert can distinguish between the machine you get and a perfectly brand new one. So learn more about this wonderful guarantee by sending the coupon now

Free Trial—Easy Payments

Remember, you don't even have to buy the machine until you get it and have used it on ten days' Free Trial, so that you can see for yourself how new it is and how well it writes. After you have decided, you pay only a little each month, in amounts so conveniently small you will hardly notice them, while all the time you are paying you will be enjoying the profits from the use of the machine. You *must* be satisfied or else the entire transaction will not cost you a single penny

SEND THE COUPON

Don't delay! Get this wonderful offer now, so you can send for and be sure of getting your Underwood at a big saving and on our easy terms. Act now—today!

TYPEWRITER EMPORIUM
Established Since 1892
Dept. 12 12 Shipman Bldg., Ravenswood and Montrose Aves.
CHICAGO

REBUILT LIKE NEW

Every typewriter is factory rebuilt by typewriter experts. New enamel—new nickeling—new lettering—new platen—new key rings—new parts wherever needed—making it impossible for you to tell it from a brand new Underwood. Also, besides the ten features pointed out above, we include many other improvements, such as two-color ribbon, back spacer, stencil device, automatic ribbon reverse, tabulator, etc., and in addition furnish FREE waterproof cover and a special Touch Typewriter Instruction Book. You can learn to operate the Underwood in one day.

FREE TRIAL COUPON

TYPEWRITER EMPORIUM CHICAGO
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Send me by return mail your Easy Payment Bargain Offer of a Standard Visible Writing Underwood. This is not an order and does not obligate me to buy.

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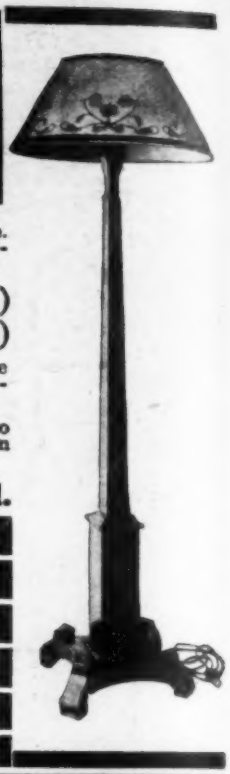
STREET or R. F. D. No.....

POST OFFICE.....STATE.....

Make Your Own Furniture

Save Over One-Half the Cost



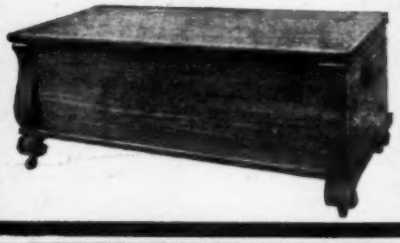
WE SHOW YOU HOW to use your spare time to advantage. With our simplified plans and directions anyone can build

Cedar Chests (3 Styles) **Floor Lamps** (2 Styles)
Morris Chairs (1 Style) **Phonographs** (2 Styles)

We furnish all the lumber, hardware and accessories and make all of the difficult parts. You assemble, finish and reap the benefits of having beautiful furniture at a great saving in cost.

MAKE BIG MONEY by building furniture and selling it to your friends. A few hours work will mean dollars in your pocket. Send for Catalog B.

Vocational Supply Co., Box 544, Muncie, Ind.



DO IT NOW

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Gentlemen—Please send me your Catalog B on Furniture Building.

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Street Address.....

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FREE BOOK

This book contains 144 pages of practical information that is of exceptional value to everyone interested in record-keeping for office, factory, store or bank. Illustrates and describes 40 different record-keeping forms.

Moore's Loose Leaf System

is the standard system of record-keeping in more than 200,000 offices.

Write for FREE Book Today.

JOHN C. MOORE CORPORATION

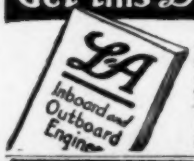
Established 1830

1139 Stone Street **Rochester, N. Y.**

Manufacturers of Loose Leaf and Bound Record Keeping Devices.

Please Mention Popular Mechanics

Get this LA Engine Book



—It gives valuable information about motor boat engines. It also describes the full line of L-A motors and tells of the 30 days' free trial plan. *Write for your copy today.*

LOCKWOOD-ASH MOTOR CO.
2012 Jackson st. **Jackson, Mich.** (22)

Mullins Steel Boats Can't Sink

When you think of buying a boat, whether it be a 16-foot Runabout, a big 26-foot Auto Boat, or something in between—remember that Mullins Steel Boats are guaranteed for life. They cannot sink, leak, water-log, dry out or open at the seams — never require calking. Designed by America's foremost naval architects — built in the largest boat factory in the world. More than 70,000 in use. Big catalog of steel or wooden motor boats, rowboats or canoes, on request.

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Work Gloves

BOSS

A complete stock of Boss Work Gloves will fill every demand of your customers for long wearing work gloves. Your jobber can supply you.

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Detachable Rowboat and Canoe Motors are standard—Built-In Flywheel Magneto, Automatic Reverse. New method of balancing gives wonderfully even and vibrationless running. Send for Catalog

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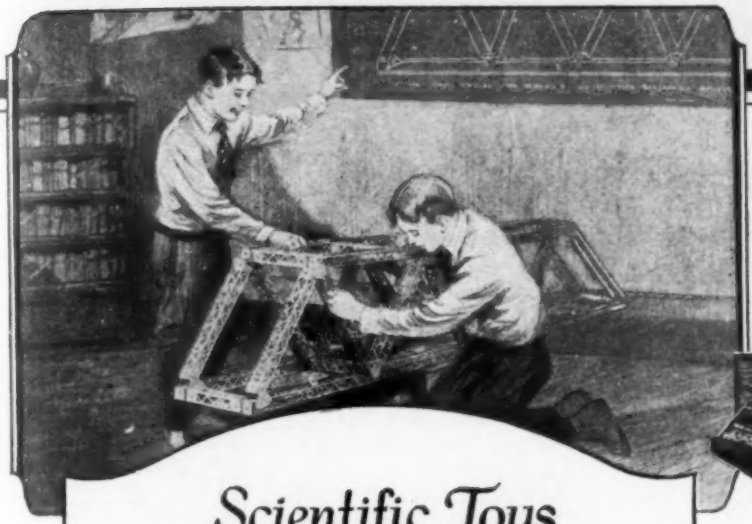

GILBERT TOYS

Scientific Toys for red-blooded boys

Do things that will lead to real success in life. Gilbert Toys will help you to be a leader among boys and later a leader among men.

Erector is the famous construction toy like real structural steel—the only one with which you could build models with square girders. Read about the other Gilbert Toys and write today, using the coupon in the corner, for "Gilbert Boy Engineering." It's the finest boys' book in years—sent at cost—25c. Folder on toys and copy of my boys' magazine free on request.

Chemistry With this Gilbert Chemistry Set you can learn a whole lot about the subject—how to make inks, bluing, ammonia, soap, dyes and hundreds of other useful things. Prices $2.50 to $9.50 (Canada $3.75 to $14.25).

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A. C. Gilbert, President

THE A. C. GILBERT CO.
104 Blatchley Ave.
New Haven, Conn.

Erector

This greatest of all steel construction toys, enables you to build realistic models of skyscrapers, bridges, cranes and all sorts of machinery. The splendid No. 6 set, illustrated above, has a miniature electric motor to run the models you build. Price $10 (Canada $15). Other sets from $2 to $35 (Canada $3 to $52.50).

Gilbert Boy Engineering

Articles on wireless, signaling, surveying, engineering, electricity, chemistry and other sciences. Football, athletic training, etc., by noted college coaches and trainers. "Flying" by Capt. Eddie Richenbacher, interview with Edison and complete catalog of Gilbert Toys. All in one book—25c.

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....Send me your Gilbert Boy Engineering Book for which I enclose 25c.

Name.....
Street.....
City.....State.....

YOU can BUILD this PHONOGRAPH *easily!*

TREMENDOUS SAVING IN COST

You don't need to be a cabinet maker. We have made it an easy and a pleasant job with

Our Simplified Plans We furnish blue prints, diagrams, motor, ready-built horn, cabinet pieces and all metal parts complete. You do the assembling, 6 models to choose from. A few hours' work, and you will have as fine a type of phonograph as any produced, and at a price away below what you would pay in a store.

Keep the Savings in Your Pocket

Machines play all records, have a wonderful tonal quality, excelled by none. No need now for any family to be without a phonograph because of the cost. THE MAKAFONE solves the problem. BUILD IT YOURSELF AT LESS THAN ONE-FOURTH REGULAR COST, but equal to the high-priced cabinet machines. Free Records with each outfit. SEND TODAY FOR FREE CATALOG and full particulars of our wonderful offer. *Many a manufacturer got his start in this way. Why not you? Build machines and sell to your friends. Ask us about this.*

"Build it Yourself"

WRITE TODAY!

MODERN PHONOGRAPH SUPPLY CO.,
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Chicago, Ill.

Gentlemen: Please send me full particulars of your Makafone proposition, without obligation to me.

Name.....

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AGENTS ATTENTION

You can make and sell this machine from our plans at a profit of $50 to $75 each. Others are selling two and three a week. Here is your opportunity to make big money and become independent. Pleasant and profitable work. START TODAY.

Modern Phonograph Supply Co.
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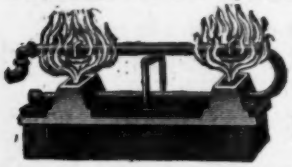
313 South Clinton St., Chicago, Ill.

AGENTS: $72 A WEEK



New Can't Clog Coal-Oil Burner Newest Invention

Most perfect burner ever invented. Intense blue flame. Can't clog up. Turns any coal or wood stove into a gas stove. Heats oven to baking point in 10 minutes. Cheapest fuel known. Low priced. Sells everywhere. Nothing else like it. Not sold in stores. Write quick for agency.

PARKER MFG. CO., 578 Coal St. Dayton, Ohio

PLANS FOR POULTRY HOUSES

All Styles. 150 Illustrations. Also copy of "The Full Egg Basket." These will surely please you—send 25c.
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Wear Absolutely Waterproof Steels

Cost less than leather, wear 3 to 6 times longer, are lighter, easier, stronger. Stop big shoe bills. Eliminate repair bills. Stop foot troubles. Prevent Colds, Rheumatism, Corns, Bunions. Keep feet warm and dry in snow, rain, mud, slush. Never change shape — comfortable always. FREE Shoe Book Tells All. Write Today
N. M. RUTHSTEIN, President

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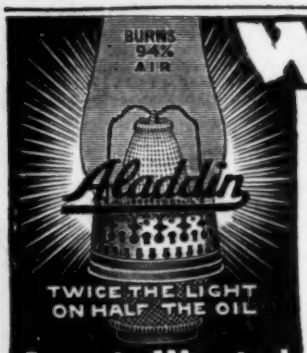
WHITE LIGHT

FROM KEROSENE Beats Gas or Electric



Agents Wanted

You can now make your home bright and cheerful and SAVE ONE-HALF on oil. Tests by Government and leading Universities prove this wonderful new Aladdin is nearly five times as efficient as the best round wick flame lamps. BURNS 50 HOURS on ONE GALLON common kerosene. No odor, smoke or noise; no pumping up; easy to operate; won't explode. Won GOLD MEDAL. Guaranteed.

Ten Nights FREE Trial

SEND NO MONEY

Prove for yourself without risk that this remarkable white light has no equal. If not entirely satisfied return it at our expense. $1000 REWARD will be given to anyone who shows us an oil lamp equal in every way to this new Aladdin.

Get Yours Free We want one user in each locality to whom we can refer customers. In that way you may get your own without cost. Write quick for 10-DAY FREE TRIAL OFFER and learn how to get one FREE.

$6000 a Year Profit from four sales a day. No experience needed. Largest concern of its kind in the world. Davidson sold 96 in one week. Flynn 72 in three weeks spare time. Boyce 25 in one evening. New Aladdin light is a sensation wherever introduced. Five times as bright as electric. Won Gold Medal. Approved and used by U. S. Government, endorsed by 35 leading Universities. Farmers have the money, they need this light, and 9 out of 10 will buy. Also big opportunity in small towns and suburbs. Excellent spare time and evening seller. NO CAPITAL REQUIRED. Sample on free trial. Write for agency proposition and exclusive territory.

Mantle Lamp Company
312 Aladdin Bldg., Chicago, Illinois
Largest Coal Oil Mantle Lamp House in the World

Get a Canadian Farm *from the* CANADIAN PACIFIC

THE Canadian Pacific Railway offers you a great opportunity to own a farm home. Many of these farms have paid for themselves with the first crop. Out of its last big block of reserved farm lands you can buy your farm under a plan of long term easy payments that is remarkable in the history of farm investments. The country is ideal for mixed farming and grain growing. Later, the same lands can be bought only from private owners—prices will be higher. Never again in North America will farm lands be offered at prices so low.

Your Last Big Opportunity

Until this land is disposed of the Canadian Pacific Railway offers you the most wonderful opportunity in the world to own a farm, achieve independence and grow rich in Western Canada. It offers to sell you farm lands in the rich open prairies and fertile park lands of the Lloydminster and Battleford Districts of Central Alberta and Saskatchewan or in Manitoba for an average of about $18.00 an acre.

Twenty Years to Earn and to Pay

The Canadian Pacific offers you this land under a plan of long term, easy payments. You pay down 10%. Then you have no payments on the principal until the end of the fourth year, then sixteen annual payments. Interest is 6%. In central Saskatchewan, Seager Wheeler grew the world's prize wheat. World's prize oats were grown at Lloydminster.

No Taxes on Improvements

There is a small tax on the land—seldom more than 20c an acre for all purposes—but there are no taxes on your live stock, buildings, improvements, implements or personal effects. Good markets, modern schools, roads, churches, amusements, make farm life desirable and attractive. Here you can achieve independence.

M. E. THORNTON
Supt. of Colonization
Canadian Pacific Railway
966 First Street, E., Calgary, Alberta

Ask the Canadian Pacific about Canada
CANADIAN PACIFIC

Bureau of Canadian Information

The Canadian Pacific Railway will furnish you from their Reference Libraries in Chicago, New York and Montreal with the latest information on every phase of Canadian life. No charge or obligation attaches to this service. You are invited to make use of it. Write or call at the Bureau of Canadian Information at 165 E. Ontario St., Chicago.
1270 Broadway, New York, or
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No Sale Without Investigation

The Canadian Pacific will not sell you a farm until you have inspected it. You must be satisfied—and every question answered before taking up your home. Investigation is invited and made easy. Don't delay your investigation. This announcement calls attention to the last great block of Canadian Pacific Reserved Farm Lands.

Special Rates for Homeseekers and Full Information

Special railway rates for homeseekers make inspection easy. Send now for free illustrated pamphlets answering all questions and setting forth figures about land values, acreage yields, climate, opportunities, etc. Do not delay.

Send coupon below for information.

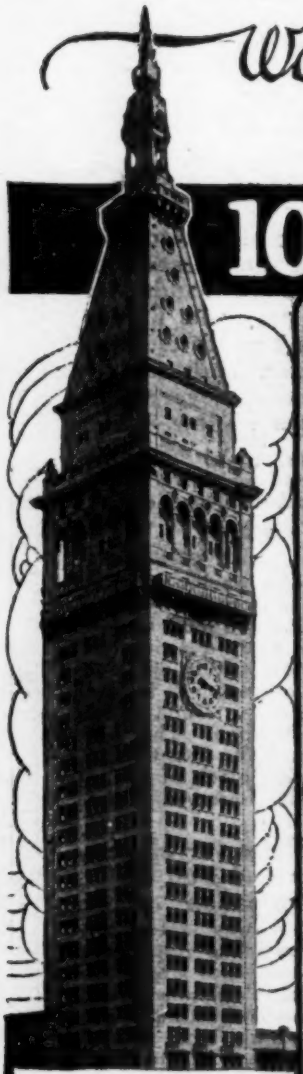
M. E. THORNTON, Supt. of Colonization
CANADIAN PACIFIC RY.
966 First St., E., Calgary, Alberta

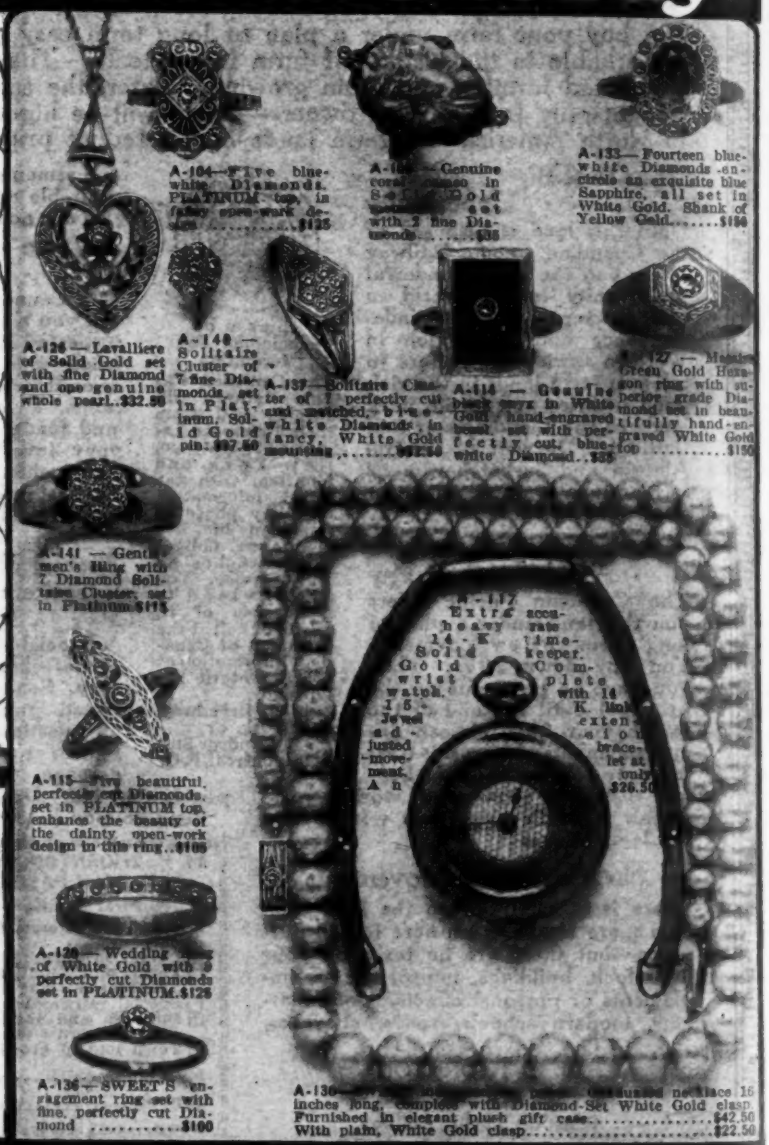
I would be interested in learning more about:
- ☐ Irrigation farming in Sunny Alberta.
- ☐ Farm opportunities in Alberta, Saskatchewan and Manitoba.
- ☐ Special railway rates for homeseekers.
- ☐ Business and industrial opportunities in Western Canada.
- ☐ Town lots in growing Western towns.

My name.....
Address.....
Town.....State.....

Wonderful Diamond Values Direct from New York

10 Months to Pay





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Goods sent on approval. No risk—no money in advance—transactions confidential. Pay only one-fifth the price upon receipt—balance in ten payments.

FREE—Beautiful de luxe catalog of holiday gifts. Diamonds, Watches and Jewelry of every description. Write to Dept. 6T.

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"THE HOUSE OF QUALITY"
CAPITAL $1,000,000
1650-1660 BROADWAY, N.Y.

Have a Business of Your Own

Start a Garage of Your Own. Thousands Needed. Good Territory Open

Dozens of M.S.A.S. Graduates Are Making from $5,000 to $10,000 a Year in the Garage Business

MAKE $500 A MONTH AND MORE

IF you are ambitious to get out of the rut and have a **business of your own,** there never was a better opportunity than there is NOW in the Automobile and Tractor Business. There are thousands of excellent openings in good territory for garages, repair shops, and service stations. Millions of automobile, truck and tractor users are greatly handicapped for lack of garages and shops that do dependable work.

Hundreds of our graduates (many of whom knew nothing of automobiles or tractors before training) are now making $5,000 to $10,000 a year. Many of these men had little or no capital.

HERE ARE A FEW EXAMPLES FROM OUR THOUSANDS OF SUCCESSFUL GRADUATES

J. S. Steckel, of Coplay, Ill., was a loom fixer at $18.00 a week. He trained at the M.S.A.S. and now he has a garage of his own paying a profit of over $100 a week.

W. F. Harms of Eldridge, Iowa, was a farm hand at $35.00 a month. Today, after training at M.S.A.S. he has a garage business and three helpers' profits are $500 a month.

Before training, Byron Hylton at Floyd, Va., was working for $40 a month. Now he has a half interest in a garage business that pays a profit of over $1,000 a month.

Before training at M.S.A.S., H. A. Bradley of Cleveland was a shipping clerk at $12.00 a week. Now he has a business of his own in Cleveland monthly profits over $500 a month.

Tony Dandrea, Austin, Pa., was a common laborer. Now he has a garage with more business than he can handle with three men.

C. F. Swanson of Sioux City, Ia., was working by the day. Now his profits run $520 a month in garage and car sales.

Martin Vander Bie and F. E. Dulyea of Holland, Michigan, M.S.A.S. graduates, have one of the best garages in Western Michigan.

M.S.A.S. TRAINING covers every point of knowledge and practice required of a successful automotive expert. We teach automobiles and tractors from A to Z. Very thorough and complete training in electrics. Actual experience in assembling, block testing, bearing scraping, repairing, including batteries. Tractor training, with actual field practice on M.S.A.S. tractor farm, included in complete Auto Course. Our equipment and training are positively the best obtainable.

Brazing and welding and tire-repairing are also taught.

The M.S.A.S. can teach you how to conduct a business of your own successfully. How to repair and sell cars, how to judge used car values and give you the necessary pointers in garage management, equipment, etc. Graduates are life members, with all service advantages free. You can return any time and "brush up" on new equipment free of charge.

OPPORTUNITIES FOR YOU

Start a Garage, a Repair Shop, a Service Station. There are thousands of openings in good territories. Very little capital is required when you know your business. You can sell cars, tractors and all kinds of accessories in connection with a garage business.

Repair and Operate Tractors. Many of our graduates train and go back to the farm and operate and repair tractors. There is big money in this work.

turning out millions of automobiles, trucks and tractors each year always need real trained men.

Factory and Other Positions Open. The factories where they are

Be a Salesman. M.S.A.S. graduates are in great demand as salesmen. Their complete and thorough knowledge of the business and the machines gives them a great advantage over the ordinary salesman.

Have a Tire Repair Shop. Think of the tremendous number of tires that require repairing each day in your district. Just multiply the number of cars by four.

Brazing and Welding is a good trade, too. Splendid opportunities for brazing and welding shops.

Or be a Lighting Plant Expert. Many positions open for service and installation experts in the farm lighting plant field.

LEADING MANUFACTURERS ENDORSE AND RECOMMEND OUR SCHOOL. They have placed their machines with us for the instruction of students. They are constantly sending us students and calling for graduates.

SEND THIS COUPON NOW

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Gentlemen:—Please send me, absolutely FREE, Big, Illustrated Catalog, "Auto School News," and information as checked below.

( ) Auto and Tractor Course ( ) Tire Repairing
( ) Brazing and Welding

(Mark each course you are interested in.)

Name.....

Street.....

.....State .....

MICHIGAN STATE AUTO SCHOOL

"The Detroit Auto School" —*"In the Heart of the Auto Industry"*

32 Auto Building
687-89-91 Woodward Ave. **Detroit, Mich., U.S.A.**

SEND NO MONEY NOW

2 FLANNEL SHIRTS Direct From Factory $3.69

Two wonderful Susquehanna Broadcloth Flannel Shirts—only $3.69. Direct from factory. No middlemen's profits. Would cost $6 or more elsewhere. Perfectly tailored. Cut extra full. Comfortable fitting. Winter weight. Soft turn down collar. Two extra strong, large pockets. Double stitched throughout. Thoroughly shrunk. For work or semi-dress. An amazing bargain. Send no money. Pay postman only $3.69 plus postage after arrival. Then try them on. If not pleased, return at our expense; your money returned at once. Order by number FS213-B. State size. Specify gray or blue. Only two shirts to a customer on this special offer.

WAREWELL COMPANY Dept. FS213-B Philadelphia, Pa.

WANTED—Railway Mail Clerks

$135 to $190 Month

Hundreds Needed at Once

MEN—BOYS Over 17

COUPON

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Sirs: Send me, without charge, (1) sample Railway Mail Clerk Examination questions; (2) schedule showing places of Winter and Spring U. S. Government examinations; (3) list of many Government jobs now open.

NAME .....

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For Grinding Valves, Fitting Piston Rings, Lapping Scored Cylinders, etc.

Send for Clover Bulletins Nos. 75 and 80
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BIG CHANCE FOR AGENTS

You can earn BIG MONEY
selling the most complete line of guaranteed transparent handle Knives and Razors with Photo, Name and Lodge Emblem—also full line of cutlery. Write today for catalogue and terms.
Golden Rule Cutlery Co., 212 N. Sheldon St., Dept. 82 Chicago, Ill.

$140 Weldit Outfit For $75

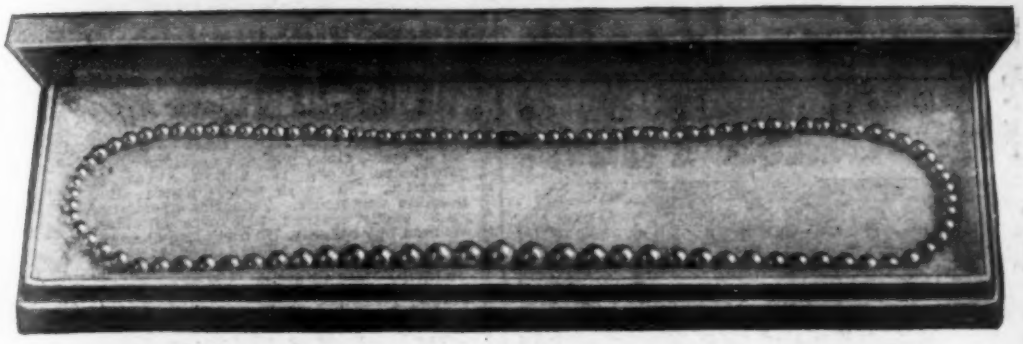
In price alone, you cannot find in the open market a welding outfit that resembles a value equal to this "Weldit" under $140 to $165. In design, proven efficiency and every detail of actual quality it is not surpassed—we might say **not even approximated at any price.**

Preferred by such representative users as Dodge Bros., Ford Motor Co., Owens Bottle Mch. Co., Studebaker Corp., Timken-Detroit, American Shipbuilding Co., Thompson-Starrett, General Motors Corp., it has stood the severest test of years and is acknowledged to be the **highest development of acetylene welding equipment.** All of our apparatus is inspected and approved by the National Board of Underwriters.

The price of only $75 is **direct to you from our factory,** backed by our reputation and **absolute guarantee.** No salesmen, commissions or dealers' profits, we prefer to do business direct with our customers at our own factory prices. Once you see this equipment you will instantly recognize the great saving and superiority of service this offer represents. **It is a value you cannot afford to pass,** if you need or use acetylene welding. We suggest that you write today for complete information. Address:

WELDIT ACETYLENE CO., 68 Grand River Ave., W., Detroit, Mich.

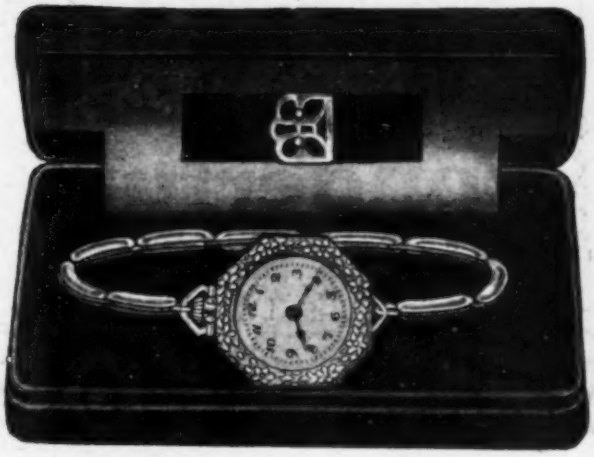
Factory Prices on Everything for the Welder.



Send No Money!

18-Inch Indestructible, Imported Pearl Necklace

Truly, one of the most remarkable values we have ever offered. An imported (French) Pearl Necklace, 18 inches in length and indestructible. An absolute $20.00 value for only $9.98. The beads have that creamy, opalescent lustre, common to the most valuable pearls and will permanently retain their wonderful beauty. Not affected by weather perspiration, and may be washed in alcohol or water. Strung on specially prepared cord, mounted with fine white gold connections. The beads are graduated in size, giving the necklace the appearance of the highly prized, genuine oriental pearls of almost priceless value. We offer the necklace at a big saving as a Special Christmas Offer to new customers. Handsome gift case included free. Sent on approval. Order by No. A201. A $20.00 value, only **$9.98**



Ladies' 15 Jewel, Imported Wrist Watch

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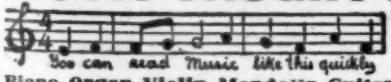

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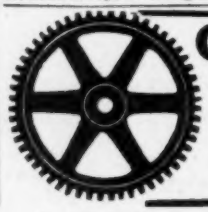

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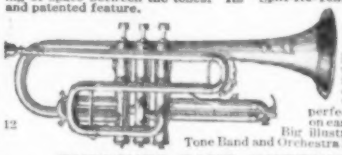

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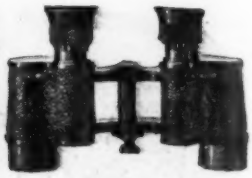

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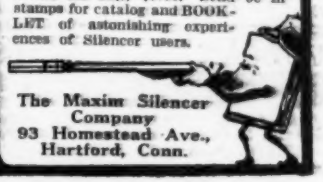

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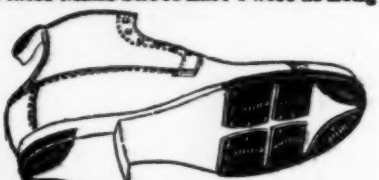

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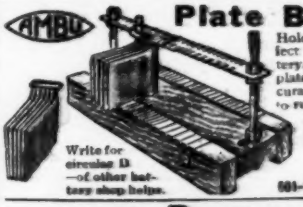

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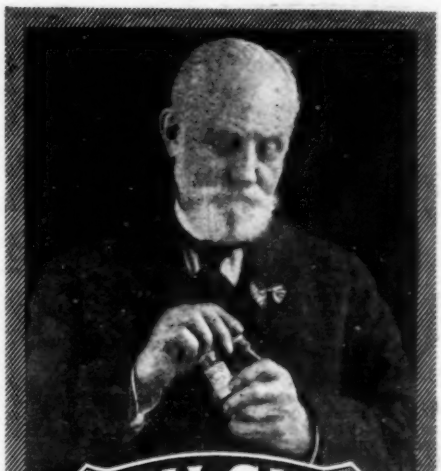

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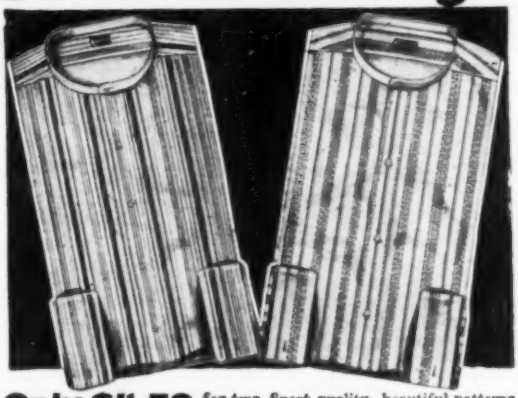

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There's big money in running the great game of American Box Ball. Many men start with just two alleys and make $100 a week. Everyone likes to play Box Ball. It's a popular sport at a popular price—only 5c per person per game. Far more fun than ordinary bowling.

No Operating Costs

Your receipts are nearly all profit. No help needed—no pin boys. Pins are set and balls returned by automatic device. Another attractive feature is the electric lighted scoreboard which operates automatically. Run this money-making game all year 'round. Have a permanent place or operate at parks, resorts or fairs. Alleys are portable and can be moved about. Scoresheet system gives absolute check on money taken in, which protects you if you hire a man to operate alleys.

You Want Money

Here's the way to make it fast. We'll help you start—let you have the equipment on easy payments. Pay us as the alleys pay you. Write us for our plan today. Mail a post card now. Don't delay.

AMERICAN BOX BALL CO.
897 Van Buren St. Indianapolis, Indiana

Pro-phy-lac-tic Tooth Brush

Battery Shops Need

This great salvage machine doubles the life of storage battery plates by pressing composition into grids. Make your shop money by getting as

AMBU PLATE PRESS

Made of heavy wood, with acid-resisting finish. Nothing to get rotten. Price $47.50. Write for circular B of other battery-shop money-makers.

AMERICAN BUREAU OF ENGINEERING
601-1601 S. Michigan Avenue, CHICAGO

MADE-TO-MEASURE 3.45

Express or Postage Prepaid

Guaranteed for 2 years solid wear or your money cheerfully refunded. These pants are a "Wonder-Value" worth $5.50 sent to you for $3.45 as a sample of fine tailoring.

AGENTS WANTED

Earn $50.00 a week in your spare time. No experience necessary. Write today for our

BIG FREE OUTFIT

with dozens of the newest styles and attractive woolen samples to choose from. Everything sent FREE.

WASHINGTON TAILORING CO.
Dept. 213 Chicago, Illinois

Christmas GIFTS on CREDIT

Ten Months to Pay The Royal Way

SHORTAGE of ready money need not prevent you from giving your loved ones the **Xmas Gifts** they long for—*buy on Credit.* The cost of a cheap, tawdry, imitation Gift will go far towards the payment of a genuine article on The Royal Credit Plan.

Rare Xmas Values

We have a large stock of the most beautiful and desirable **Diamonds, Rings, Watches, Toilet Sets and other Gifts.** These are rare Holiday Values at amazingly low prices.

Buy Now For Xmas

The Xmas rush and consequent mail congestion will soon be upon us. Make your selection NOW and to be sure of getting exactly what you want on time—you can buy now as well as later, for in buying the Royal way, you have

Ten Months to Pay

No money in advance. Order now—pay 20% upon examination and balance in ten equal monthly amounts. See and examine any selection. Then, if pleased, send first payment and the balance in easy monthly installments. Money promptly refunded on any unsatisfactory purchase, if returned within 10 days. Liberty Bonds accepted. 10% discount allowed for cash.

New Royal Catalog 262—Free

Write Today, addressing Dept. 262

Describes and illustrates, in beautiful halftone reproduction, all of our rich values in exquisite Xmas Gifts. Tells exactly how to take advantage of our confidential credit plan.

Low Prices

We buy in large quantities and give you rock bottom prices. Lower than you could buy for cash from your jeweler. ORDER AT ONCE to get the advantage of these wonderful Xmas bargains.

Note—Illustrations in this advertisement are reduced in size about one half.

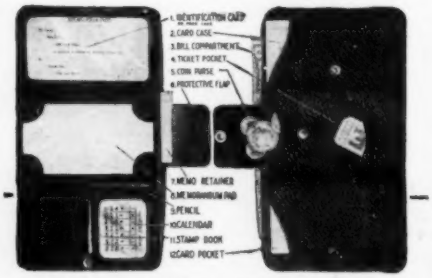
ROYAL DIAMOND & WATCH CO.
ESTABLISHED 1895
35 Maiden Lane - New York

Quality + Quantity

You get quality plus quantity in the "American Gentleman" bill-fold. Quality in the soft, genuine leather. Quantity in the combination of 12 useful features. (See picture.) It is a bill-fold you will find daily need for. It is neat, good-looking, compact. Stitched throughout, no edges pasted. Choice of tan or black. Buy the "American Gentleman" for $1.50 at any dealer's. Or send $1.50 with your dealer's name and we will mail you one postpaid.

Charles K. Cook Company, Inc.
Dept. B, Camden, N. J.

Dealers—write for profitable dealer proposition



Makers of Boston Bags, Suit Cases, Manicure Sets, Hand Bags, Billbooks

For Chilly Autumn Mornings

USALYTE

A TWIST OF THE WRIST

USALYTE, the extraordinary heater, robs the Fall and Winter morning of its sting and makes early rising a pleasure.

Your room is flooded with heat almost instantly by a mere twist of the wrist!

Usalyte is an absolutely new, safe, quick and cheap means of using gas for heating purposes. It will pay for itself a dozen times over, the first season, by the coal it saves.

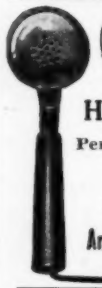
In two styles: for heating only or, with the new and exclusive in-built mantle, for heating and lighting.

For heating only, $1.75
For heating and lighting $2.25

Order from your dealer or direct from us. Take no inferior substitutes.

Dept. P. M.

J. L. ROBIN & SONS Inc.
MANUFACTURER OF THE FAMOUS USALYTE GAS MANTLES
130th to 131st ST. and PARK AVE.
NEW YORK CITY.



EXPERIMENTERS ATTENTION!

High Grade Microphone Transmitter
POSTPAID FOR 60 CENTS
Perfect Articulation
Extreme Sensitiveness
High Current Capacity
Light and Durable
Nickel and black finish. Has two feet conductor cord with terminals.

American Thermophone Co. 114-116 Bedford St. BOSTON 11, MASS.

A Double Money-Maker

Every auto repair shop should have this steamer. Softens compound in batteries for easy opening while you are busy elsewhere. Makes distilled water for filling batteries. You can make money with an

AMBU Battery Steamer
WITH CONDENSER

Opens batteries without chance of breakage. Easy to operate—low upkeep—efficient and economical. Type "A" with steaming box $62.00. "B" connection direct to cell $35.00. Ask for circular A of other battery shop money-makers.

AMERICAN BUREAU OF ENGINEERING, CHICAGO

OH! JUST WHAT I WANTED

Real Model Racing Yachts
Sail Faster Than You Can Walk

Sport for Men and Boys. Construction Set, complete, 30 in. long, with Riggings, Fittings, and HEAVY LEAD KEEL, ready to assemble. 5 screws, 20 brads and Yacht is built. Also same Model Finished ready to sail. Just printed book on "Model Yacht Sailing" sent for 25 cents and your dealer's name and address, giving full instructions of the Sport; How to sail, rig, nautical terms, etc., etc.

NEW YORK MODEL BOAT & MFG. CORP.
Suite 226, 18 Broadway NEW YORK CITY

WHITE FLAME

BURNERS make your old kerosene lamps and lanterns give a brilliant white light better than electricity or gas. Doubles your light. Saves oil. NO MANTLE TO BREAK. Guaranteed Safe and Reliable. Delights every user. Send now for complete sample postpaid 50 cents, stamps or coin. 3 for $1.25. **Money Back if Not Satisfactory.**

Live Representatives Wanted. Exclusive Territory.

WHITE FLAME LIGHT CO., 68 Clark Bldg., Grand Rapids, Mich.

HELP WANTED

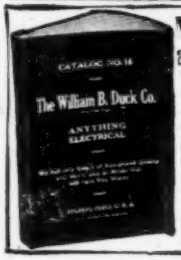
We require the services of an ambitious person to do some special advertising work right in your own locality. The work is pleasant and dignified. Pay is exceptionally large. No previous experience is required, as all that is necessary is a willingness on your part to carry out our instructions.

If you are at present employed, we can use your spare time in a way that will not interfere with your present employment—yet pay you well for your time.

If you are making less than $150 a month, the offer I am going to make will appeal to you. Your spare time will pay you well—your full time will bring you in a handsome income.

It costs nothing to investigate. Write me today and I will send you full particulars by return mail and place before you the facts so that you can decide for yourself.

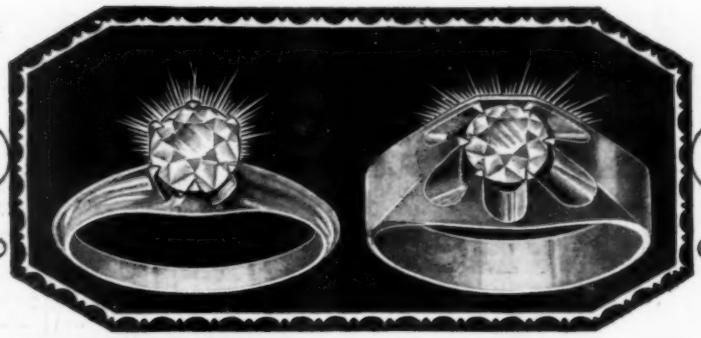
ALBERT MILLS, Gen. Manager Employment Dept.,
2805 American Bldg., CINCINNATI, OHIO



New Big No. 14-200pp. Wireless and 100 pp. Electrical Catalog

Wireless catalog mailed for 12c and electrical catalog for 6c. You may deduct this amount on first $1.00 purchase. Catalog not sent otherwise. Any wireless amateur will tell you it is the one catalog to have. As an encyclopedia of information it is invaluable. The largest and most elaborate radio catalog published. Values that cannot be duplicated elsewhere.

THE WILLIAM B. DUCK COMPANY
223-227 Superior St. TOLEDO, OHIO



If You Can Tell a Lachnite from a Diamond, Send It Back

Here is a man-made gem that has the eternal fire of the diamond. It is cut like a diamond, stands the diamond tests and is guaranteed forever. Over 150,000 people wear them. We will send your choice of the 2 illustrated above, mounted in solid gold on 10 days free trial.

Send No Money Just send us the coupon with your name, address and finger size and we will send you either ring you prefer When it comes make the first deposit ($4.75) with the postman. Wear it 10 full days If you can tell it from a diamond send it back and we'll refund your deposit If you decide to buy, merely pay the balance at $2.50 a month. The total price of either ring is only $18.75.

Order Today Use the coupon or a letter or a post card. Be sure to send your finger size. To do this cut a strip of paper just long enough to meet over the second joint of the finger on which you wish to wear the ring. Send the coupon now—and not a penny in cash.

Harold Lachman Co., Dept. 1779 204 So. Peoria St. CHICAGO, ILL.

Harold Lachman Co. Dept. 1779 204 S. Peoria St. Chicago, Illinois

Send me, prepaid, Ladies' / Men's ring on 10 days' free trial. When it comes I will deposit $4.75 with the postman. After ten days I will either return the ring or send you $2.50 a month until the balance has been paid. Total cost to me, $18.75. If I return the ring before 10 days you will refund my $4.75 immediately. I enclose my finger size.

Name.....

Address.....

HAMILTON 22 CAL. RIFLE WITHOUT COST

1000 SHOT ALL STEEL MAGAZINE AIR RIFLE FREE

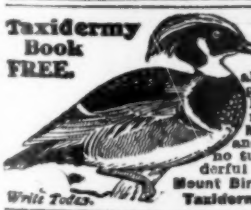
WE GIVE TO BOYS

Choice of Six Guns (on four easy plans) for selling our Magic Healing Wav-o-Lene at only 25c Box. WE TRUST YOU! Order Six Boxes Today On Postal Card—We send promptly, Prepaid! Easy to Sell—the Healing Ointment needed in every home! Sell at once, return money, as we direct, choosing your Gun according to one of the Plans shown in our Big Premium List. 200 Other Gifts! Or Big Cash Commission! Just for promptness a Free Gift—So ORDER TODAY!

350 SHOT REPEATING AIR GUN GIVEN

WAVERLY SUPPLY CO. 235 Tower Bldg., Monongahela, Pa.

To get the greatest enjoyment from your pipe, be sure "It's a W D C."
WM. DEMUTH & CO., New York



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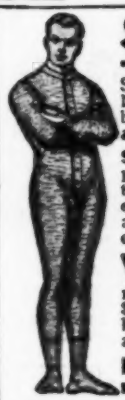
Stuff Beautiful Birds. Learn by mail to stuff and mount all kinds of birds, animals, fish and game heads; make rugs, tan skins. Mount your own specimens and make money preserving for others. Men, women and boys learn easily and quickly. Success guaranteed or no tuition. Write today for our wonderful FREE book "How to Learn to Mount Birds and Animals. N.W.School of Taxidermy, 9779 Elwood Bldg., Omaha, Neb.

Write Today.



Send No Money

Snap this bargain up right now before it is too late. Only limited quantity. Amazing underwear bargain. Greatest offer ever made. **Two Guaranteed $4 Each, Wool Unionsuits, $5.75.**

Save big money on your underwear. Send postcard or letter today—this very minute, for these 2 beautiful perfect fitting heavy weight gray elastic rib unionsuits. Full cut. Seams reinforced and overcast. **Send No Money**—pay only $5.75 on arrival, no more; we pay delivery charges.

We Guarantee to refund your money if you can match these 2 wonderful **wool** unionsuits for $8.00. Order this amazing bargain this minute before it is too late. Just give name, address and breast measure.

BERNARD-HEWITT & COMPANY
Dept. U2212 900 W. Van Buren, Chicago

SAVE 25% to 60%

on slightly used

GRAFLEX-KODAKS

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CENTRAL CAMERA CO., Dept 112, 124 S. Wabash Ave., CHICAGO

GREEN AUTOMATIC MACHINE

ADD TO YOUR INCOME

WITH LITTLE EFFORT $5 to $10 A DAY MADE EASY WITH

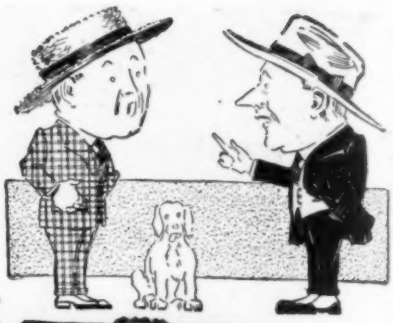
New Improved Green Automatic Machine

"AMERICAN" Key Cutter

Sharpens, Hones and Strops all kinds of safety razor blades, in one operation, from four to six blades per minute. For both Quality and Quantity, this machine is in a class by itself. There is nothing like it on the market. Let us send you our free booklet explaining everything, including the **"AMERICAN" Key Cutter**—cuts square, angular or round slots.

AMERICAN SHARPENING MACHINE CO. (Inc.), Dept. 12, 184 W. Washington St., CHICAGO

Take a Tip from Kalamazoo Owners



Why pay fancy prices for a good stove? Take a tip from Kalamazoo owners and see how much you can save by dealing direct with manufacturers.

Send for Our New Big Catalog

Get wholesale "Direct-to-You" prices on the most beautiful stoves and ranges ever made. Also get our money-saving offer on a Kalamazoo Pipeless Furnace and on electric and hand-power washing machines, sewing machines, phonographs, Congoleum Floor Covering, Aluminum wear and other household articles. All at prices that really save money. This is our year to make a dent in the high cost of living. It's your year to save money. Let us help you do it. We pay freight. Quick shipment. 30 days' trial. Money-back guarantee.

Ask for Catalog No. 473

KALAMAZOO STOVE CO., Mfrs.
Kalamazoo, Mich.

"A Kalamazoo Direct to You"
Trade Mark Registered

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10 Cents

WORTH OF COMMON ORDINARY **KEROSENE** or **Coal Oil** will keep this lamp in operation for **30 HOURS** and will produce

300 CANDLE POWER

of the purest, whitest and best light known to science. Nothing to wear out or get out of order. Simple, Safe. Absolute satisfaction guaranteed. Send for catalog showing lamps for every purpose; also special introductory offer and agency proposition. Write today.

No Wicks to Trim
No Smoke
No Smell

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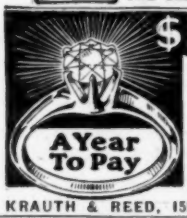
The "BEST" LIGHT

Positively the cheapest and strongest light on earth. Used in every country on the globe. Makes and burns its own gas. Casts no shadows. Clean and odorless. Absolutely safe. Over 200 styles. 100 to 2000 Candle Power. Fully Guaranteed. Write for catalog. AGENTS WANTED EVERYWHERE.

THE BEST LIGHT CO., 324 E. 5th St., CANTON, O.



$500 REWARD

We will pay $500.00 reward to anyone who can permanently dim the brilliancy of the RAJAH Im. diamond without destroying the stone.

RAJAH Im. Diamonds

They stand all diamond tests—fire, acid, file and glass cutting. Their brilliancy is eternal. Guaranteed for a lifetime. Set in solid gold and sent to you on **30 Days' Free Trial**. If you can tell it from a real diamond return it. Send today for our beautiful FREE illustrated jewelry catalog in colors. Write now.

KRAUTH & REED, 159 N. State Street, Dept. P2, Chicago, Ill.

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300 CANDLE POWER OF LIGHT AT A COST OF 1/8c PER HOUR

BURNS KEROSENE OR GASOLINE

Kerosene lamps make and burn their own gas from common kerosene (coal oil) and are an achievement surpassing all other known methods of artificial lighting. Same give a bright and steady white light at a very low cost, as a 300 candle power lamp will only consume one gallon of kerosene in 62 hours. The "QUICKLIT" gasoline lamps CAN BE LIT WITH AN ORDINARY MATCH like city gas.

WRITE FOR ILLUSTRATED CATALOG of our complete line of kerosene and gasoline lamps and lighting systems.

Agents Wanted

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Send for our big instructive 256-page well-bound HANDYMAN Book-Catalog. Every home-owner, contractor, farmer, mechanic, institution, etc., needs it. Shows over 10,000 fixtures and supplies in plumbing and heating at wholesale; how to save skilled labor, hard work and unnecessary material by our new

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Big Handy Man Book

We have spared no effort, and have gone to a GREAT EXPENSE to compile this valuable book, and to keep from sending it to uninterested persons, we request 25c, which will be refunded on your first order or send for our free bulletin.

Write today and save.

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Why use Coal or Wood?

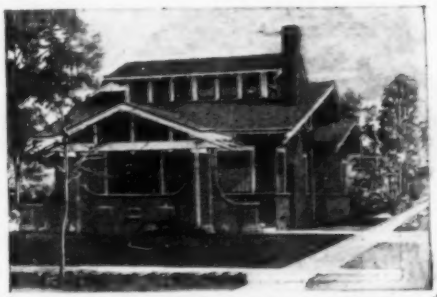
Just turn a valve to cook or heat

THE OLIVER OIL-GAS BURNER

Does away with coal and wood — Cheaper. Makes your stove or range a gas stove. Gives more heat. Keeps your home warmer.

No fires to make. No ashes, dirt, smoke, odor, chopping, shoveling—carrying coal or wood. Saves hours work. Makes your stove bake better, cleaner, quicker. Thousands in use over 10 years. Doesn't change your stove, simply sits in fire box, easily slipped in or out, absolutely safe. Lasts lifetime. Makes its own gas from coal-oil (kerosene) at small cost. Gives even heat instantly, much or little. Saves money, time, labor, whether you burn coal or wood. Sold under money-back guarantee —30-day trial. Write for FREE literature and special introductory price. **AGENTS WANTED.** (References Required)

OLIVER OIL-GAS BURNER & MACHINE CO.
2014 Pine St., ST. LOUIS, MO.
Western shipments from San Francisco



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Our Guaranteed Ready-Cut System of furnishing material, machine cut, is the only way to build your ideal home right without wasting time or money. Our simplified Marking and Bundling System is instantly understood by anyone. Write for full particulars now!

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The 1920 Harris Free Book of Plans includes more than a hundred other beautiful homes with complete details—the culminated efforts of the world's leading home specialists. Our Free Plan Offers give you Blueprints of uniform scale, easy to read.

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Little Wonder Oil Heater

The Greatest Improvement of the Age in Oil Heater Construction

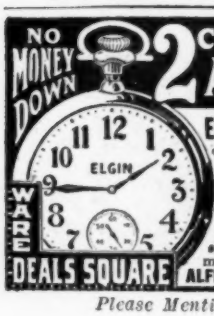
No wick, no smoke, no soot, no noise—and the hottest heater made. And one gallon of kerosene is equal to three in any other oil heater, due to the patent air valve through which air is forced into the oil tank and thence to the burner, vaporizing the oil and making a regular blue gas flame. Throws an intense heat, which can be regulated at will by air valve. Generated with denatured alcohol or gasoline, and perfectly simple to operate. Stands 29-in. high; beautifully finished, an ornament in any room. Price $17.50 f.o b. Factory.

A positive guarantee goes with every heater.

Use the Little Wonder Oil Heater this winter instead of so much high-priced coal. If your dealer cannot supply you, send money order or check direct to Factory and heater will be shipped at once with full directions and guarantee.

Little Wonder Stove Co.
3527 GABLE AVE. DETROIT, MICH.

NO MONEY DOWN — 2 CREDIT ALL $2 A MONTH



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ALFRED WARE CO., Dept. 263, St. Louis, Mo.

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Light and Power From One Electric Socket

Makes electricity doubly convenient. Fits any electric light socket.

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The acknowledged leader

"Every wired home needs three or more"

At your Dealer's **3 for $3.50** OR $1.25 EACH

Benjamin No. 2452 Shade Holders enable you to use any shade with your Two-Way Plugs

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Beautiful HOUSES and BUNGALOWS CAN BE BUILT FOR $900 AND UP

This and many others in my new book, Building Plans for Modern Homes, will save you hundreds of dollars. One of the most complete and comprehensive books of plans ever published by any architect. Fifth edition just off the press. Two hundred and fifty floor plans and photographs of bungalows, etc., costing from $200 up; gives sizes and cost to build. **Sent postpaid for $1.00**

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The Personal Writing Machine

Bennett Homes Better-Built Ready-Cut **Catalog FREE**

One glance at the beautiful Bennett Book will prove the character and beauty of Bennett Better-Built, Ready-Cut Homes which save you $300 to $800. Send for your copy — TODAY. It is FREE. Write

BENNETT HOMES
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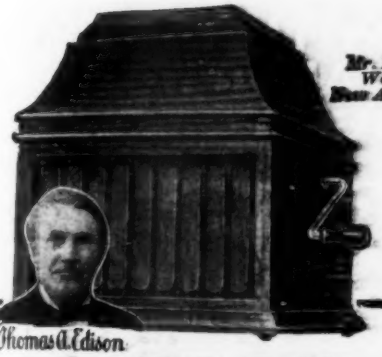
Burn Kerosene in Your Cook Stove

The Simplex Oil Burner installed in your ordinary coal or wood stove, makes it an efficient Gas Stove. Just turn a valve and get even heat instantly. No coal or wood. No fires to make. No ashes and smoke. Solves fuel problem. **Saves** hours work. Cooks and bakes better. Absolutely **Safe and Simple.** Any child can operate it. Doesn't change or damage stove. **Saves Money.** Makes its own gas from Kerosene (coal oil). Cheaper, quicker and cleaner than coal or wood. **FIVE YEAR GUARANTEE.** Write for **FREE** literature and Special Offer Today.

AGENTS WANTED. Write for special agent's proposition.

HANSEN HALLIBURTON MFG. CO.
Dept. 1779 9 South Clinton Street CHICAGO, ILL.



Only $1.00 Down

Keep the New Edison Amberola — Edison's great phonograph with the diamond stylus—and your choice of records, for only $1.00. Pay balance at rate of only a few cents a day. Free trial in your own home before you decide to buy. **Write for our New Edison Book and pictures of the New Edison Amberolas.**

F. K. BABSON, Edison Phonograph Dist., 1359 Edison Blk., Chicago, Ill.

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Music Roll Perforator

MAKES MUSIC ROLLS of ANY COMPOSITION — OF MUSIC —

FOR YOUR PLAYER PIANO

Let the Leabarjan Mentor Teach Music in Your Home

Used by Player Owners, Musicians, Schools and Colleges.

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Brings out the full quality of old and new records and saves them from destruction. Eliminates all needle changing expense and worries.

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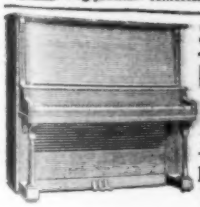

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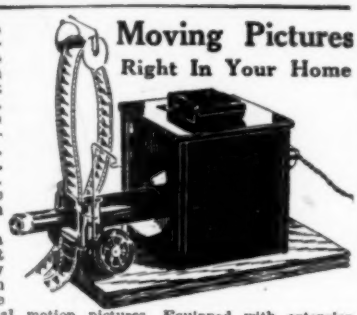

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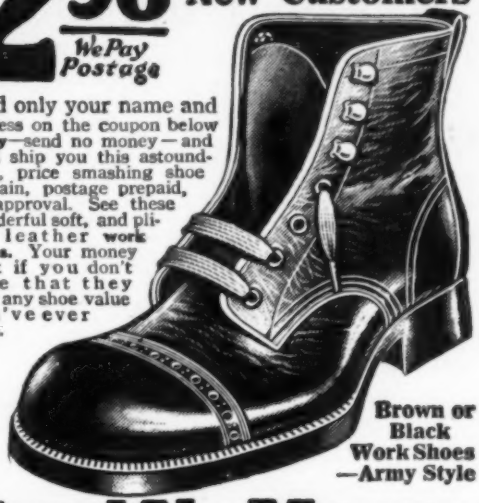

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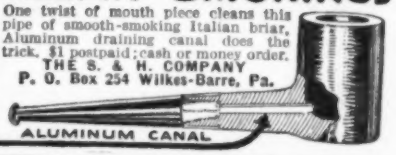

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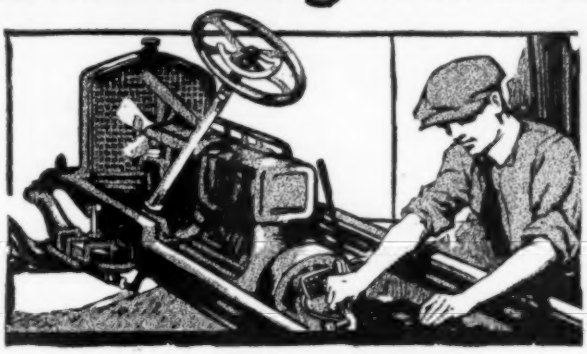

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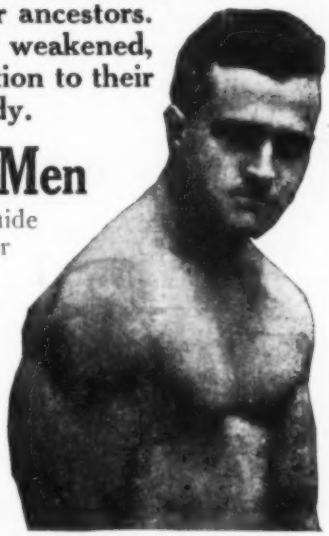

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We also manufacture White Cross Electric Irons, Toaster Stoves, Grills, Immersion Heaters, Heating Pads, Curling Irons, Fans, Medical Batteries, Hair and Shoe Dryers.

Handled by Reliable Dealers Everywhere

Lindstrom-Smith Co., Dept. 1779 3212 W. Lake St., Chicago

NO MORE BALD HEADS

WHEN our VACUUM CAP is used a few minutes daily. We accept no pay until you have tried the Cap 60 days and are satisfied. The Vacuum Cap is an appliance that draws the blood to the Hair Roots and starts a new healthy crop of hair. It stops Dandruff, stops the hair from falling out. Bought by Doctors and men who know that it is the only reasonable HAIR GROWER known to science. No Drugs Used. Write for application blank, testimonials, and booklet on "HAIR," sent sealed in plain envelope, FREE.

THE MODERN VACUUM CAP CO.

G 559 BARCLAY, DENVER, COLO.

The Brillianite Gem has the lustre and sparkle of the finest diamond. Just send size of finger and ring desired. We will send you the Brillianite in Gold Filled Ring. Wear the ring 2 days (if you or your friends can tell it from a genuine diamond send it back) and we will refund your money. Simply pay postman $3.75 on arrival, our special price to introduce this gem.

HATTON & HATTON, Dept. D-50, 4436 Calumet Ave., Chicago, Ill.

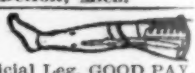
NO JOKE TO BE DEAF

—Every Deaf Person Knows That I make myself hear, after being deaf for 25 years, with these Artificial Ear Drums. I wear them day and night. They are perfectly comfortable. No one sees them. Write me and I will tell you a true story, how I got deaf and how I make you hear.

Medicated Ear Drum
Pat. Nov. 3, 1906

Address
GEO. P. WAY, Artificial Ear Drum Co. (Inc.)
80 Adelaide St., Detroit, Mich.

Fibre-Lite Limbs

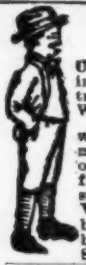


Easy Payments—Do Nature's Work.

AGENTS WANTED who use Artificial Leg. GOOD PAY.

FREE Fibre Sample. DESCRIBE STUMP TO **WORMAN CO.** 252-P HENNEPIN AVE. MINNEAPOLIS, MINN.

THROW YOUR VOICE



Under the table, down in the cellar, into a trunk or any old place. With our Ventrilo which fits into the mouth you can have lots of fun fooling your friends. Also full instructions in the art of Ventriloquism, and big book of jokes. Sent by mail for 10 cts. Stamps or coin.

AERIAL AIR-SHIP UP IT GOES

Climbs in the air by its own power.

The propeller spinning automatically at a lively rate. Floats around a room or out doors. Lots of fun. By mail 10 cents.

Invisible Ink

Letters written with this ink look like blank paper. Can be brought out plainly by heating over lamp or stove. Bottle in wooden box 10c.

SKULL RING

The eyes in this ring are either Emeralds or Rubies and would scare the timid. Either Roman Gold or Oxidized Silver. 25c by mail

WONDERFUL WIRELESS TELEGRAPH

Two instruments and 2 Codes in a box. Can Telegraph from room to room or house. Full instructions. By mail 12 cts.

All the Above by Mail for 50 cts.
STAMPS OR COIN

UNIVERSAL NOVELTY CO.
DEPT 305 STAMFORD CONN.

YOU can BUILD this PHONOGRAPH *easily!*

TREMENDOUS SAVING IN COST

"Build it Yourself"

You don't need to be a cabinet maker. We have made it an easy and a pleasant job with

Our Simplified Plans We furnish blue prints, diagrams, motor, ready-built horn, cabinet pieces and all metal parts complete. You do the assembling, **6 models to choose from.** A few hours' work, and you will have as fine a type of phonograph as any produced, and at a price away below what you would pay in a store.

Keep the Savings in Your Pocket

Machines play all records, have a wonderful tonal quality, excelled by none. No need now for any family to be without a phonograph because of the cost, THE MAKAFONE solves the problem. BUILD IT YOURSELF AT LESS THAN ONE-FOURTH REGULAR COST, but equal to the high priced cabinet machines. Free Records with each outfit. SEND TODAY FOR FREE CATALOG and full particulars of our wonderful offer. *Many a manufacturer got his start in this way. Why not you? Build machines and sell to your friends. Ask us about this.*

AGENTS ATTENTION

You can make and sell this machine from our plans at a profit of $50 to $75 each. Others are selling two and three a week. Here is your opportunity to make big money and become independent. Pleasant and profitable work. START TODAY.

Modern Phonograph Supply Co.
392 Springer Bldg., 313 So. Clinton St., Chicago, Ill.

WRITE TODAY!

MODERN PHONOGRAPH SUPPLY CO.
392 Springer Bldg., 313 So. Clinton St., Chicago, Ill.

Gentlemen: Please send me full particulars of your Makafone proposition, without obligation to me.

Name .....

Street Address .....

City or Town .....

$4 or $5 a month WILL BUY
A Standard, Guaranteed
TYPEWRITER
With Every Modern Writing Convenience
Write Today For Illustrated Circular Explaining Try-Before-You-Buy Plan

SMITH TYPEWRITER SALES CO.
(Harry A. Smith) 910-218 No. Wells St., Chicago, Ill.

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5 Master Keys $1.00

Have a set of the most wonderful keys in the world, which open hundreds of different locks and replace hundreds of different keys. Used by locksmiths, janitors, and detectives. A recognized convenience and necessity. Beaded key chain included.

MASTER KEY CO. 6 Manhattan Bldg. MILWAUKEE, WIS.

New 400 Candle Power Lamp

Gives a soft, brilliant, glowing light; restful to the eyes; an ideal illumination.

BURNS 96 PER CENT AIR

100 times brighter than kerosene lamps. Burns 96% air and 4% common gasoline. Lamps and Lanterns for every purpose. Clean—odorless—economical.

ABSOLUTELY SAFE

Can be carried anywhere—perfectly safe, even if tipped over.

LIGHTS WITH ONE MATCH

New patented twin mantle burner lights with **One Match** easily and quickly. Greatest improvement of the age.

SEND NO MONEY Write for Catalog. Special Agents' Offer, also Money-back Trial Offer. Write today.

THE AKRON LAMP CO.
112 Lamp Building, Akron, Ohio, U. S. A.

AGENTS WANTED

An Easy Squeeze

with a

Corco Bottle Capper

Puts metal crown caps on any size crown top beverage bottle without adjustment. Corco is always ready. Made of cold rolled steel it is mechanically perfect. Nickel-plated, satin-finish. Weight only 10 ounces.

Positively no danger of cut fingers from broken glass. Absolute security; no leakage.

A Household Tool

There are many delicious non-alcoholic beverages, such as Root Beer, Ginger Ale, Pop, Grape Juice, Phosphates, Cider, etc., which you can make and bottle in your own home, if you have a Corco Bottle Capper.

Price $2.50

If your dealer cannot supply you, send his name and address and money order direct to us. We will send one Corco capper to you, postage prepaid.

Corco Manufacturing Company
1062 McCormick Building, Dept. 439 Chicago

New Electric Health Brush

Makes Its Own Electricity! **TRY IT 30 DAYS** **For Health and Beauty**

Here at last is a wonderful Electric Health Brush which generates its own electricity by the simple pressure of your thumb. Entirely NEW. nothing like it. The healthful, invigorating, healing effect of electricity now brought to you anywhere. Just press lever with thumb, and high-frequency current passes through every cell and tissue. Wonderful for hair, scalp, complexion. Stimulates blood and nerves. Relieves rheumatism, neuritis and other pains. Builds health, strength and energy.

Makes Its Own Electricity
No Batteries Used
No Cords to Connect
No Wiring

One of the greatest electrical inventions of the age. All Self-contained—No socket needed. Contains no batteries of any kind. Costs nothing to use. Nothing to renew or replace. Self-generating electricity. No connection to dangerous electric circuit. Attachments for use on any part of the body. Endorsed by physicians. Fully covered by patents.

Feel Great!

Use the Wonder Electric Health Brush every morning and night. Puts new life and energy into you. Feel fine every day. Electricity now in your handbag or suitcase for traveling. Weighs only 10 ounces. Wire bristles. Strong or weak current as desired. Try it 30 days free. Mail coupon.

Write For 30 Days' Trial Offer

We want you to See and Try the Wonder Electric Health Brush before you obligate yourself to keep it.

Send the coupon. We will mail you our Special Introductory Price and 30 Days' Trial Offer. Try wonderful brush in your own home. See how remarkable it is. See how it generates its own electricity with thumb pressure. Examine it thoroughly. Then send it back if it isn't the greatest electrical health device you ever saw. You take no risk on this offer. Every penny back if you are not completely satisfied.

For the Hair—For Complexion—For Bodily Health

Try this Wonder Electric Health Brush for the hair and scalp. See how it invigorates, how it stimulates. Try it for the complexion, with special attachment. (No extra charge for attachments.) Try it on your rheumatic joints, your body. See how it makes you tingle with life and health.

30 Days' Trial

Take 30 days to prove the Wonder Electric Health Brush. See for yourself what it will do for you. See how convenient it is. See how practically indestructible. Try it in every way for 30 days.

Send Coupon Now

If you want to feel like a new person every morning, if you want new life, new health, new beauty and new energy, mail coupon. Do it NOW, before the Special Introductory Price and Offer are withdrawn.

McKINLAY STONE & MACKENZIE
Sole American Distributors
Dept. 512, 30 Irving Place, NEW YORK

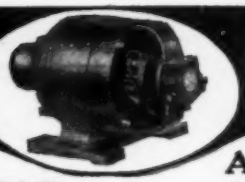
McKINLAY STONE & MACKENZIE
Sole American Distributors,
Dept. 512, 30 Irving Place,
New York.

Send me Your Special Introductory Price and 30 Days' Trial Offer on the Wonder Electric Health Brush.

Name.....

Address.....

MOTOR BARGAINS



BUY A NEW GUARANTEED MOTOR — **ASTOUNDINGLY LOW PRICES**

Reliable Makes Only

GENERAL ELECTRIC MOTORS, Single Phase, 60 cycle, A. C., 110/220 V., Repulsion-Induction, 1750 speed.

¼ H.P.	$ 41
½ H.P.	69
1 H.P.	97
2 H.P.	137
3 H.P.	167

Sliding base included with motors 1 H. P., or larger.

ST. LOUIS MOTORS, Three Phase, A. C., 220 V., 60 cycle, 1750 speed, complete with pulley and base.

½ H.P.	$ 45
1 H.P.	60
2 H.P.	80
3 H.P.	90
5 H.P.	108

Note: Three phase motors are equipped with SKF ball bearings.

GENERAL ELECTRIC MOTORS, Direct Current, shunt wound, 220 Volts, complete with pulley, base and starting box.

½ H.P., 1150 speed	$ 87
1 H.P., 1700 speed	80
1½ H.P., 1700 speed	91
2 H.P., 1700 speed	102
3 H.P., 1700 speed	138
5 H.P., 1700 speed	182
10 H.P., 1700 speed	274
10 H.P., 1150 speed	325

ELECTRICAL SUPPLIES

Fuse plug	$ .06
Snap switch	.30
Key socket	.30
Chain pull socket	.57
Lamp cord—per ft.	.03
Friction tape—½ lb. roll	.40
Rubber tape—½ lb. roll	.40
Swivel attachment plug	.20
Pull apart attachment plug	.20
Wire solder—per lb.	.65
Soldering paste, 2-oz. can	.10
Two way socket	.98
Bell ringing transformer	1.45
Bell wire, per lb.	.60

Send for complete list of supplies. NO orders filled for less than $1.00.

SOLD ON MONEYBACK GUARANTEE

Every Motor is absolutely guaranteed to give perfect satisfaction. If for any reason you are dissatisfied with your purchase, we will cheerfully refund your money.

SPECIAL OFFER

GENERAL ELECTRIC 1/4 HP Motor 110 V. A. C. 60 cycle single phase, 1750 Speed. Complete with Cord, Plug and Grooved Pulley.

$23.50 Will operate Washing Machines, Sewing Machines, Small Lathes, Grinders, Bottle Washers, Etc.

SHIPPING TERMS

25% Deposit required on all orders, Balance C. O. D. by Express or Sight Draft attached to freight Bill of Lading.

WRITE FOR OUR ILLUSTRATED CATALOG

HYRE ELECTRIC CO. 615 So. Dearborn St., CHICAGO

Make $40 a Day

Wood will be in demand this winter. You can make big money with the Phillips One-Man Drag Saw—

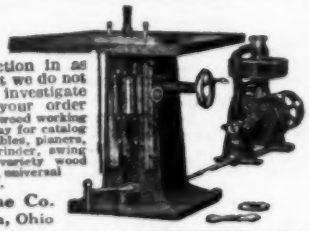
Saws 15 to 35 Cords Daily

Fells tree—makes ties. Engine also runs other farm machinery. "I ran my Phillips Saw one day and made $36.80 sawing stove wood lengths. All done with one man—easily.—J. A. Coverdale." Just send name—a card will do—for free folder and money saving prices.

PHILLIPS DRAG SAW MFG. COMPANY
766 Phillips Building, Kansas City, Missouri.

CRESCENT MACHINES

are giving entire satisfaction in as many different places that we do not hesitate to urge you to investigate their merits and place your order now if you expect to need any wood working equipment in future. Send today for catalog of band saws, jointers, saw tables, planers, planers and matchers, disk grinder, swing saws, post borer, shapers, variety wood workers, hollow chisel mortiser, universal wood workers, table cut off saw.



The Crescent Machine Co.
93 Columbia St., Leetonia, Ohio

Small Steam Engines and Boilers

GAS AND GASOLINE ENGINES, ⅙ H.P. up; Pumps, Gears, Model Makers' Supplies, Castings, Etc.

Catalog and List sent for 15c stamps (or coin preferred).

MODERN ENGINE & SUPPLY CO.
342 Monadnock Block, CHICAGO

Tight, leakless pipe-threads

are rapidly cut and rapidly *multiplied* by Oster Belt and Motor Machines. An Oster Machine works so fast and accurately that you need use it only an hour a day to make it pay for itself in money saved. The machine is so simple that a boy can operate it, to thread straight pipe, bent pipe, nipples or bolts.

Send for book "Actual Pipe-threading Experiences"

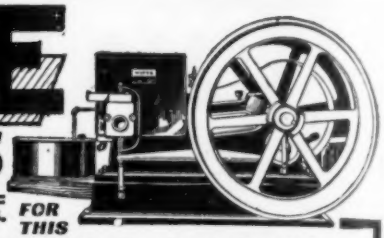
The OSTER Manufacturing Company

2100 East Sixty-first Street, Cleveland, O., U. S. A.

WITTE

2 H.P. ENGINE PULLS 2¾

$54.95 F.O.B. K.C. FOR THIS



COMPLETE ENGINE ON SKIDS —From Pittsburgh add $5

All Sizes and Styles—Gasoline or Kerosene —2, 3, 4, 6, 8, 12, 16, 22 and 30 H-P.—NOW LOWER!

Direct to You

Don't wait if you need any size or style engine. NOW is the time to buy while we are making Special Low Prices.

Life Guarantee Against Defects.

Big surplus horse-power. Safe delivery guaranteed. —Immediate factory shipment.

WITTE Log Saw

$125.00 F.O.B K. C.

From Pittsburgh add $5.00

Most practical outfit for sawing logs into lumber, cord wood or stove wood lengths—a rig for farmers and timber men. Complete control of saw blade—Starting and stopping by means of Hand Lever. 4-cycle WITTE Engine with speed regulator—5-ft. saw. At low cost additional we can supply Tree Saw for cutting down trees. Makes Log Saw a Tree Saw.

Saws 50 to 75 Cords a Day.

Lever Control, Arm Swing, Force Feed.

WITTE Power Saw Rigs

My Power Saw-Rigs are big, powerful, durable rigs that men can use a lifetime and make money. Big value—no toy stuff—but rigs that easily cut 50 to 75 cords of cordwood into stove length in a day, according to size engine. Built in 4, 6, 8 and 12 H-P. sizes. Complete all-steel trucks—all ready for business. Write for latest, new low price list. Tell us whether you want a Stationary Engine, a Power Saw-Rig, or a Log Saw. Big catalog and price list Free.

(Write for Log and Tree Saw Catalog—FREE)

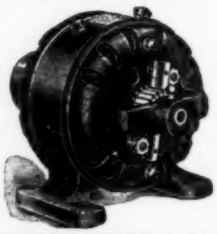
WITTE ENGINE WORKS

1746 **Oakland Ave.** **Kansas City, Mo.**
1746 **Empire Bldg.** **Pittsburgh, Pa.**

Send For Catalog "NP-4" Describing Our Full Line of Power Transmission Machinery.

W. A. JONES FOUNDRY & MACHINE COMPANY
4419 W. Roosevelt Road, CHICAGO, ILL.

110 V. A. C. Generators
Only $5.00



Hand generators, but can be run by other power if desired. Used, but in perfect condition.

Very Special while they last, at $5.00.

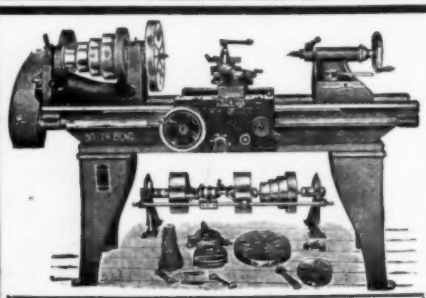
Order from this ad.

Standard generators and motors, like cut, all sizes.

WATSON ELECTRIC CO., Dept. 12, Gas Bldg., Chicago

INSYDE TYRES

Inner Armor for auto tires. Prevent blowouts and punctures. Double tire mileage. Easily applied to any tire between casing and tube. Not a reliner. Used over and over. Will not heat or pinch. Details free. Agents wanted. Liberal profits.
American Accessories Co. Dept. T-1652 Cincinnati, O.



How to Run a Lathe An 80-page book, postpaid to any address for ten cents silver or stamps of any country accepted.

South Bend Lathes
For the Machine and Repair Shops

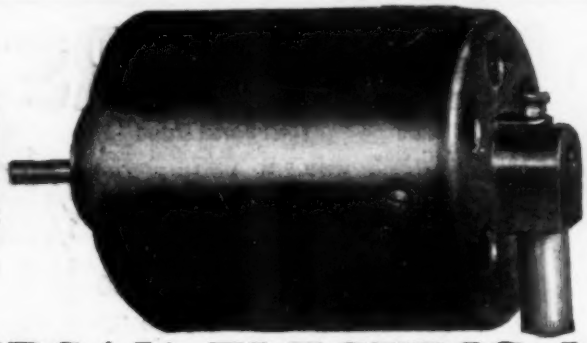
11" Lathe	$250.00	18" Lathe	$ 735.00
13" "	385.00	21" "	900.00
15" "	483.00	24" "	1250.00
16" "	550.00		

Made with straight or gap bed. Price includes equipment as shown in illustration. **South Bend Lathes have been on the market fourteen years.** Est. 1906

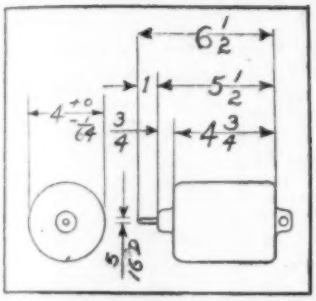
South Bend Lathes are in use in Machine Shops in 54 countries throughout the world.

Free catalog mailed on request

SOUTH BEND LATHE WORKS, 625 E. Madison St., SOUTH BEND, IND.

$8.50  $8.50

UNIVERSAL ELECTRIC MOTOR



This sturdy Universal motor will operate washing machines, sewing machines, small buffers. Ideal for machine shops handling light tool jobs. Weight, complete with 10 foot cord and plug, 9½ lbs.

Absolutely O. K. Sold only cash, money order, or certified check.

Dimensions as shown at left.

Mail shipping instructions with order.

Only 600 Motors Left at Above Price.

UNIVERSAL UTILITIES CORPORATION Alpena, Michigan U. S. A.

AGENTS NO INVESTMENT—Exclusive Territory For Nationally Advertised AUTO ACCESSORY

Big Profits Tested and proved by United States experts and French Government. Saves gasoline—increases power—destroys carbon. Universal market, big profits and chance to establish own business without any investment.

Write or wire for territory. SPARKO-GAP COMPANY, 54 W. 29th St., NEW YORK

EXACTLY LIKE PICTURE

Swing 4 in., 21 in. between centers. 17 in. total length. Shipping weight 13 lbs. Bed of lathe is machined. Workmanship first-class. Equipped with wood turning chuck. Can be fitted with 3 in. face plate and drill chuck as special equipment. Order one today. Price $6.00 cash with order. Made also in larger sizes. SYPHER MFG. CO., Dept. D Toledo, Ohio

MECHANICALLY RIGHT

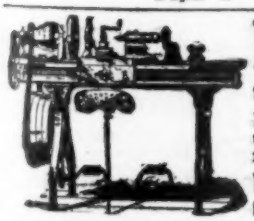
Little Giant Drill Press

Just the thing for small shop, and experimental work. Mechanically right and well made. Size 0 to ¼" drill. Weight 22 lbs. Price $15.00

Send for circular

SYPHER MFG. CO.

Dept. "D" Toledo, Ohio



LATHES

9 to 18-inch Swing

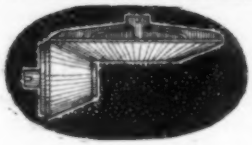
List price $100 and up according to size. When ready to buy send for Lathe Catalog and prices.

W. F. & John Barnes Co.

100 Ruby Street, ROCKFORD, ILL.

ROCKWOOD

Friction Transmission



Eight Good Reasons

—why Rockwood Friction Transmission is better than toothed gears for many constant and variable speed machines.

Extremely simple in design.
Sturdily constructed to stand hard service.
Operates with absolute quiet.
Transmits power with unrivaled efficiency.
Speed range is unlimited.
Starts quicker, accelerates faster, stops easier.
First cost is much lower.
Repairs are cheaper and needed less often.

Investigate these advantages for your machines. Tell us your requirements.

Send for free 92-page book

The Rockwood Mfg. Co.

1946 English Ave. Indianapolis, U. S. A.

NEW MOTORS

FACTORY GUARANTEED
ALL SIZES
PROMPT DELIVERY

Charging Generators
Suitable for all lighting, Battery Charging and Power Requirements.

8 v, 10 amp. . . . $19.50
15 v., 10 amp. . $26.50
40 v, 6 amp. . . $31.50
110 v, 2½ amp. $31.50
110 v, 5 amp. . . $52.50
40 v, 12 amp. . . $52.50
110 v, 9½ amp. $67.50
40 v, 25 amp. . . $67.50
110 v, 18 amp. $116.50
40 v., 50 amp. $116.50
110 v, 26 amp. $156.50
110 v, 50 amp. $238.50
Moving Picture Arc Generator 60 v., 35 a. $116.50

Polyphase Motors
2 and 3 phase, A. C., 220 v 60 c., 1750 R.P.M., Complete with base and pulley.

½ H. P. . $46.50
1 H. P. . $66.50
2 H. P. . $86.50
3 H. P. . $98.50
5 H. P. $116.50
1 H. P. Special Grinding and Bufing Motor . $106.50

Direct Current Motors
110 or 220 volts, D. C., shunt wound, 1750 R. P. M. With base pulley and starting box.

1/4 H. P. Washing Machine Motor . $28.50
1/4 H. P., 32 v. Washing Machine Motor $28.50
1/2 H. P. . . $58.50
1 H. P. . . . $82.50
2 H. P. . . $124.50
3 H. P. . . $142.50
5 H. P. . . $218.50

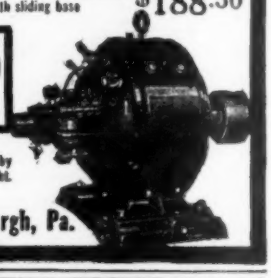
Single Phase Motors
110-220 volts, A. C., 60 cycle, 1800 R. P. M. with pulley

1/4 H. P., 220 v. induction Washing Machine Motor $28.50
1/4 H. P., 110 v. grinding bufing motor . . . $28.50
1/2 H. P. induction, full load start $46.50
1/2 H. P. repulsion induction For compressor service $54.50
1 H. P repulsion induction, Special Garage Motor . . $74.50
2 H. P. repulsion induction with sliding base . . $126.50
3 H. P. repulsion induction with sliding base . . $146.50
5 H. P. repulsion induction with sliding base $188.50

WRITE FOR CATALOG. BARGAINS IN MOTORS AND GENERATORS

1/4 SPECIAL H.P. 110 volts A.C., 60 c. S. P., 1750 R.P.M., Complete, cord, plug and pulley

WASHING MACHINE MOTORS Suitable for operating Small Compressors, Coffee Grinders, Bottle Washers, Etc. $26.50 Each Reg. Val. $34.50



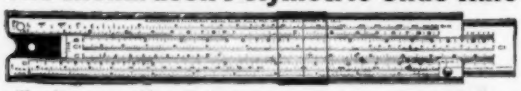
MONEY BACK GUARANTEE

SHIPPING TERMS: 25% deposit required on all orders. Balance C. O. D. by Express. Sight draft with Bill of Lading attached by freight.

MANUFACTURERS' DISTRIBUTER

CHAS. H. JOHNSTON, Box 15, West End, Pittsburgh, Pa.

The Richardson Polymetric Slide Rule



will solve any problem that can be solved with the regular Mannheim and has many additional advantages. It is Direct Reading and has a Cube and an Inverted Scale for handling three factors at one setting. It is a complete Electrical Slide Rule. The scales are on white celluloid, Engine Divided, and are guaranteed permanently accurate. Length 10 inches. Grease, water, weak acids or alkalis will not injure this rule. Frameless runner. "The Slide Rule Simplified," 100 pages, gives complete instructions for using this rule and shows how to extend slide rule calculations to seven or eight figures. Nothing so complete has heretofor been published. Catalog free. Price with case and 100 page Instruction Book, $4.00.

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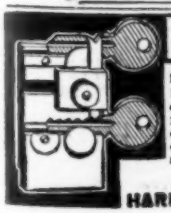

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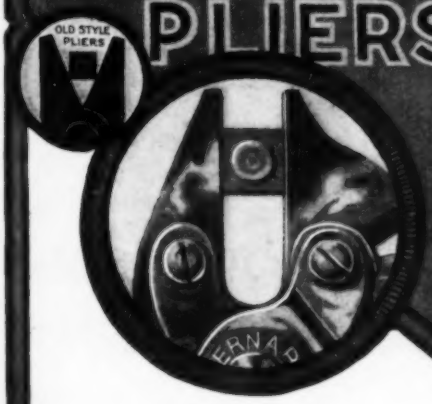

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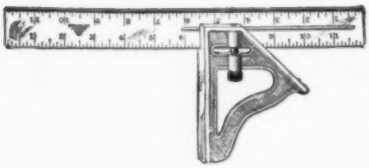

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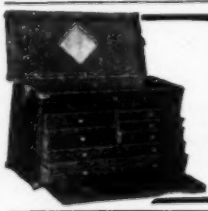

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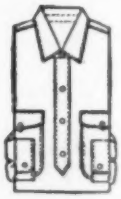

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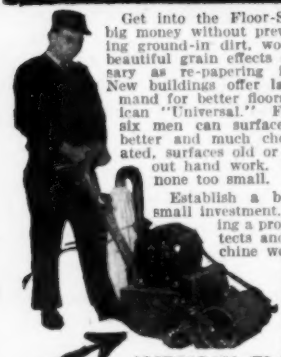

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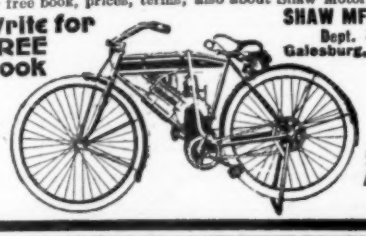

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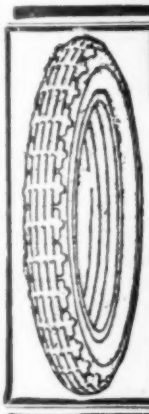

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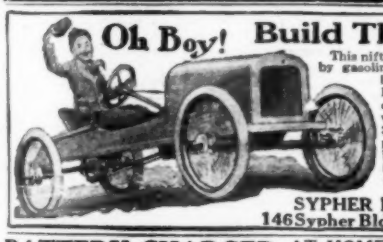

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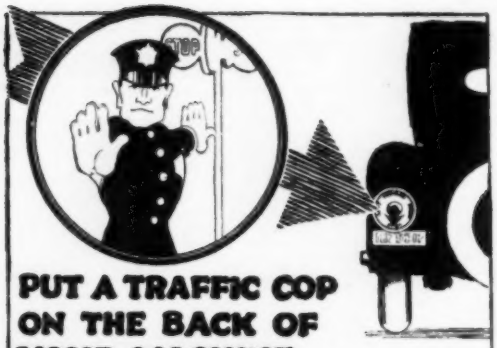


PUT A TRAFFIC COP ON THE BACK OF YOUR MACHINE

You can't stick your arm out in Winter—yet you have to tell the driver in the rear which way you are going to go.

THE SAFE WAY IS THE WRIGHT-WAY

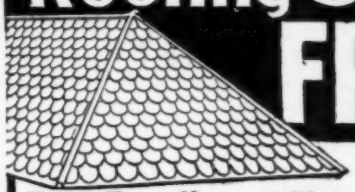
—It tells your story. Write for pamphlet "Preventing Accidents."

Dealers and Agents—territory available.

PRICE **$8.50**

The WRIGHT Traffic Signal Co.,
Dept. B-5 Cincinnati
Manufacturers dies, tools, special machinery and deep draw press work.

Roofing Book FREE



World's
Best Roofing at Factory Price

Don't buy Roofing of any kind until you get our big Free Roofing Book, describing full line of Edwards Famous "Tightcote" Galvanized Roofings, Sidings and Ceilings, and our lowest factory prices. Then see for yourself how much we save you by selling direct and saving you all in-between dealers' profits.

EDWARDS "REO" Metal Shingles

Absolutely rust proof. By our patented "Tightcote" process, edges as well as sides of metal sheets are heavily coated with zinc—not a space the size of a pin point exposed to weather. Fire and lightning proof. Outlasts three ordinary roofs. Forever wind and weather proof. Need no repairs—end all roofing expense. Patent INTERLOCKING DEVICE makes water tight seams—all nail heads covered—no chance for rust or leaks.

EDWARDS Galvanizing Test

Edwards "Tightcote" Galvanized Roofing can be bent, twisted or struck by lightning, and the galvanizing will not crack or flake. Bend it or hammer it—you can't loosen or scale the galvanizing. No other galvanized roofing can withstand this test.

Low Priced Garages

Wide variety of styles, all sizes of Portable Fireproof Metal Garages. Lowest prices ever made. Postal brings Big Garage Catalog free.

Write Today for free samples and proof that we can save you a lot of money on any kind of roofing, siding or ceiling you may need. Ask for Roofing Book No. 1250.

THE EDWARDS MFG. CO.,
1200-1250 Pike St., Cincinnati, O.

FREE Samples & Roofing Book

STANDARD Demonstrating TIRES

Used on Demonstrating Cars—Repaired and Retreaded

Size	Tires	Tubes
30x3	$ 6.50	$2.00
30x3½	7.50	2.25
32x3½	9.00	2.40
31x4	9.50	2.50
32x4	10.50	2.65
33x4	11.50	2.80
34x4	12.50	2.90
34x4½	13.50	3.00
34 4½	13.50	3.00
35 4½	14.00	3.10
36 4½	15.00	3.25
35x5	15.50	3.35
37x5	16.50	3.50

SEND NO MONEY—JUST THE COUPON

ROYAL TIRE & SUPPLY CO.
1461 Michigan Ave.
Dept. P Chicago, Ill.

Ship by Express—Parcel Post (state which) used, **Demonstrating Tires and Tubes** I have checked, with privilege of examination. If satisfactory will pay C. O. D. Want S. S.—Cl.—(state which).

Name.....
Address.....
Postoffice.....State .....

5% allowed if full amount is sent with order.

The Seneca MOTOR CAR — **Built for the Owner** — **$1185.00**

Simple, sturdy construction. Low cost of up-keep and operation. Cantilever springs in rear. Comfortable, easy-riding.

4-cyl.—27 H.P. 98 in. wheel base

Dealers Wanted

Immediate deliveries. Fifth successful year. Increased output. Liberal newspaper advertising in dealers' territory. Wonderful opportunities. Write or Wire NOW

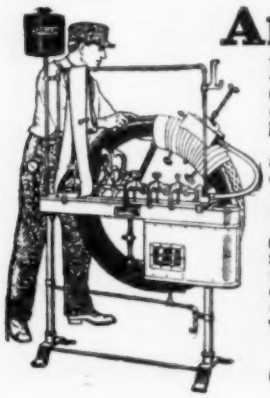
THE SENECA MOTORCAR CO., 32 Seneca Factory, FOSTORIA, OHIO

You Can Save $50.00

By recovering your old auto top frame yourself. We make these recovers to fit all makes and models of cars. Any person that can drive a car can put it on. We furnish instructions. Roof and quarters sewed together with rear curtain, fasteners, welts and tacks. All complete. Give us the name, year and model number of your car, and we will send you our catalogue with samples and quote you exact price.

$8.46 and up Parcels Post Paid

LIBERTY TOP & TIRE CO., Dept. E7, Cincinnati, O



An Easy Way to Make Money

Don't be content to plod along on a small salary. Be independent. Go in the tire repairing business and make $60 or more a week. One man made $45 the first day he received his outfit. **Others are making $25 a day and hundreds of wide-awake men are making $200 to $500 a month.**

No experience needed. We teach you how. Very little capital required. But slight risk, as every car owner in your town is a possible customer. Jobs are plentiful because tires blow out and puncture every day. Business is good the year round.

SHALER Tire Repair Outfit, $75

Will do as much and as perfect work as the big $250 to $500 vulcanizing outfits. A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has **Automatic Heat Control.** It must vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

WRITE FOR FREE BOOK "HOW TO OPEN A TIRE REPAIR SHOP" and complete Catalog, which gives full information.

WRITE QUICK BEFORE SOME HUSTLER GETS AHEAD OF YOU.

C. A. SHALER CO., 2011 Fourth Street, WAUPUN, WISCONSIN

WHEN you ride 30 miles on a train you pay for 30 miles —no more—no less.

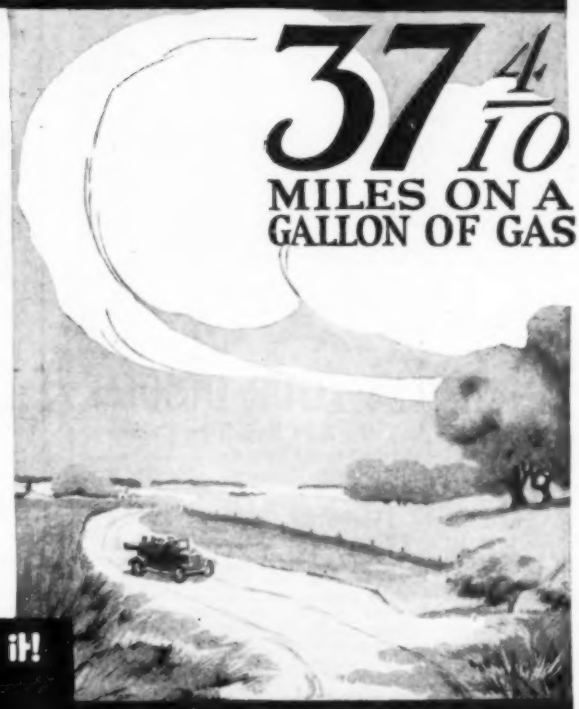
When you drive your Ford 30 miles do you pay for more than that? Are you paying for several miles of travel that you do not receive? Why not get it? The new Stromberg Carburetor makes it possible. It has brought about great fuel cost reductions for tens of thousands of Ford Owners.

It holds the World's Official Economy Record—37-4/10 miles on a gallon of gas.

Equipped with new, improved easy starting attachment—ready to install.

See your dealer at once or write us for complete descriptive matter.

Stromberg Motor Devices Company
Dept. 1214, 64 E. 25th St., Chicago, Ill.



New STROMBERG CARBURETOR Does it!

Winton Six

No matter how bad the weather, the closed car user travels in good cheer and comfort.

Write today for descriptive folder

THE WINTON COMPANY

945 Berea Road **Cleveland, Ohio**

United States Tires are Good Tires

NEED AUTO PARTS?

A Million Parts a Year Pass Through Our Great Shops. Immense Variety Always on Hand.

We Are the Original

"We Tear 'Em Up and Sell the Pieces"

Over 100 Makes and 300 Models on Hand

Save 50% to 80% on Replacements

Send for Latest Prices!

Every Part GUARANTEED or Money Refunded. Write for What You Need.

AUTO WRECKING COMPANY, Dept. P, KANSAS CITY, MO.

The Original—"We Tear 'Em Up and Sell the Pieces."

$100 WEEK AND MORE FOR YOU!

TIRE SURGERY —the NEW and BETTER tire repair method is making men **RICH!** Chas. Evans, carpenter, past 50, now **MAKING** $100.00 week in shop shown here. N. E. Gibbard of Mich., aged 62, learned **TIRE SURGERY**, has shop in small town, writes: "cash receipts for **May, June and July 1920, $30,000.**"

HAYWOOD'S TIRE SURGERY

is easy to learn. I teach you in two weeks. Within 30 days you're started on road to fortune. Car owners **EVERYWHERE** demand this **NEW** repair method, as it DOUBLES life of Tires. 28 million tires wearing down **DAILY.** 1,000 MORE Tire Surgery shops needed badly. **ANY MAN** can succeed **QUICKLY. It's a SHORT, EASY** step into automobile industry —the field that has made men rich. It put $6,000 in bank for John W. Blair, Ohio, in 12 months, got $3,000 for Fleming, of New Zealand, within 1 year; and has done same for hundreds of others. There's money in this business for YOU. Investigate! Get details. Send coupon for FREE book.

Haywood Tire & Equipment Co.
964 Capitol Avenue
Indianapolis,
Indiana

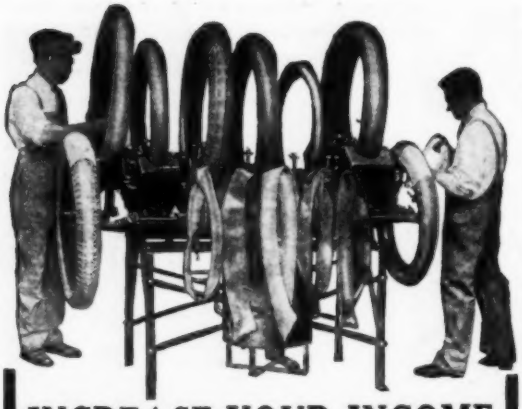
WRITE

Mr. M. Haywood, Pres.
Haywood Tire & Equipment Company,
964 Capitol Ave., Indianapolis, Ind.

Dear Sir:—
Please send by return mail full details of Tire Surgery as I want to go into good paying business.

Name _____

Address _____



INCREASE YOUR INCOME

You can do it in the Tire Repairing Business. Thousands of tires need repairing and Tire Rebuilders are in great demand. Profits are big and business grows fast.

You can make $3,000 to $5,000 a year in a business of your own with the

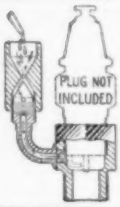
Vanderpool Vulcanizer

Previous experience unnecessary; our Home Study course will prepare you for immediate business. Large Profits from small investment. Write for descriptive Catalog and Price List.

VANDERPOOL VULCANIZING CO.
SPRINGFIELD, OHIO, Dept. 6-K. U. S. A.

PREPARE FOR WINTER

SIMPLICITY PRIMING CUPS FOR FORD CARS (Set of Four), **$3.75**



No change in motor—no special tools required. Just remove spark plug with usual wrench and insert primer cup. All done in few moments and your troubles are over for the winter. Order today. Dept. 201.

F. M. SMITH SALES AGENCY
112 W. Adams Street Chicago

Classy Fidelity Bodies for Fords

Stylish Club Roadsters Speedsters and Touring Models

High Quality At Low Price

THEY FIT ANY FORD CHASSIS

Dealers you can make big money equipping old second hand Fords with Fidelity Bodies, prices $47.85 and up. They will sell at 100% profit. Send for ***"The Little Salesman"*** Catalog.

Dept. Ax., New England Mills Co., 1027 W. Van Buren St., Chicago

Auto Owners WANTED!

To introduce one of the best automobile tires in the world. Made under our new and exclusive Internal Hydraulic Expansion Process that eliminates **Blow-Out—Stone-Bruise—Rim Cut** and enables us to sell our tires under a

10,000 MILE GUARANTEE

We want **an agent** in every community to use and introduce these wonderful tires at our astonishingly low prices to all motor car owners. We have a plan by which you can obtain

Free Tires for Your Own Car

if you become our representative. Write for booklet fully describing this new process and explaining our amazing introductory offer to owner agents.

Hydro-United Tire Co. Dept. 100 PHILA., PA.

MOTOR REPAIR BOOK FREE

Why spend dollars for repairs when *cents* will do? Write for *Free* booklet "P" and learn how SMOOTH-ON IRON CEMENT will save repair expense. 1 lb. can 50c, 6 oz. can 30c, at Hardware and Auto Supply stores. By mail add 5c for postage

SMOOTH-ON MFG. CO.
Jersey City, N. J., U.S.A.

SMOOTH-ON IRON CEMENT No.1
For Motor and Household Repairs

Akron-Williams
TIRE REPAIR EQUIPMENT

Turns out perfect work the first time. Saves money, material and time.
Write for Catalogue. *Everything for the Tire Building and Repair Man*
THE WILLIAMS FOUNDRY & MACHINE CO., AKRON, OHIO

TRAINED AUTO SALESMEN
Sell Motor Cars—Trucks—Tractors

Why not make big money selling automobiles, trucks and tractors? There is a shortage of trained auto salesmen today. You can be the best salesman in the best selling business in the world. We offer, at small cost, a complete selling course covering entire field from getting prospect to closing sale. Can be mastered in few weeks. Previous auto experience not needed. Send for particulars today.
AUTO PUB. CO., 245 West 55th St., New York.

SELL WIZARD—THE WONDER WINDSHIELD CLEANER

Once over—a second's time, behold! glass is clear and stays clear for 24 hours. Marvelous Chemical Felt pad works wonders—cleans automatically—sheds rains like a duck sheds water. Rain, snow, sleet, fog, vanish like magic, flatten out, "melt away." Nothing to do but drive, hands free, vision clear. Nothing else like Wizard. It's new, powerful. Makes all other cleaners look crude. **Fits and beautifies any car**—open or closed—turn nut—that's all. Ornamental steel enameled mountings. **Guaranteed for life of car.** Thousands giving satisfaction. **Price low—only $1.50 prepaid. Satisfaction guaranteed or money refunded.** Truly the perfect cleaner that every car owner wants. Prevents accidents, saves time, money, worry. **Best thing ever invented.**

We Want Distributers Everywhere Every motorist waiting—buys on sight. Big profits, exclusive territory, enormous demand. Cash in on this winner. Details free. **SECO MFG. CO. Dept. 40, TOLEDO, OHIO**

STOP
The Leak With
RADIATOR NEVERLEAK

Beware of radiator leaks! Carry a can of this wonderful liquid in tool kit, always ready to pour into water in radiator when leak occurs. Stops leaks in 5 to 10 minutes.

Saves expensive soldering and does a better job. Guaranteed satisfactory and positively will not clog or impair cooling system. Millions of cans sold. 75c a can at all dealers or sent direct.

BUFFALO SPECIALTY CO.
"The LIQUID VENEER People"
357 Ellicott St. Buffalo, N. Y.

Starts Cold Fords Quick

No more water carrying and waiting in zero weather. Just twist the crank or step on the starter and you're off at once with the aid of the

HOT SPOT GENERATOR

Starts Ford motors instantly in any weather. Few drops of gasoline or alcohol do the work. Saves strength, gas, time and batteries. Operated 100 times for 1 cent. Quickly attached with wrench. Out of the way. Never wears out.

$1 postpaid, if dealers can't supply you. Your name on card brings illustrated folder. Write today.

Agents—Wonderful selling device. Universally needed. Territory going fast. Get yours now.

REPLACEMENT PARTS CO.
424 Cambridge Street Kansas City, Mo.

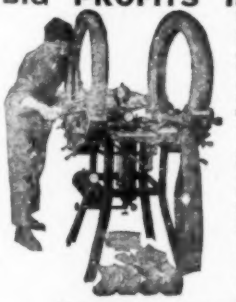
Buchstein's Fibre Limb

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities.

Send for Catalog Today

D. BUCHSTEIN CO.
113 6th St. S., MINNEAPOLIS, MINN.

BIG PROFITS IN VULCANIZING



Make $10 to $30 per day with Anderson Steam Vulcanizers. Better tire repairing at one-tenth the usual cost. Big profits.

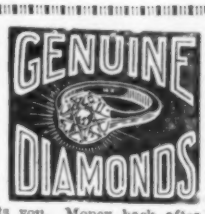
We teach you the famous Anderson method of vulcanizing, also the operation of the Anderson Super-heated Vulcanizer and Anderson Retreader and how to build up a successful business in your town with little capital.

There are Anderson schools of vulcanizing in 34 states. It's the schooling plus equipment that makes Anderson tireologists distinctive.

The course requires 5 to 10 days and costs $35.00. If you buy an Anderson Vulcanizer any time we refund your $25 and pay you $5 per day expense money for each day of the 10 days served because we sell the work you do.

ANDERSON STEAM VULCANIZER CO.
103 Williams Bldg., Indianapolis, Ind., U. S. A.

1 CARAT BLUE-WHITE SOLITAIRE $197



Wonderfully sparkling diamonds, glowing with a fiery radiance unsurpassed at double our price. Choice of man's or woman's 14 Kt. solid gold ring of finest workmanship, free with diamond. Fractions of carat priced proportionately. Valuable premium free if cash accompanies order. Our guarantee protects you. Money back after 30 days' free trial if not satisfied. **Ask for R138.**

REAL $35 VALUE — ONLY $15.00

23 Jewels, Full 12 Size, Men's Gold Filled Watch

BIGGEST VALUE IN HISTORY! Guaranteed movement, timed, adjusted, regulated. Gold filled case guaranteed to wear like solid gold 20 years. Sold on 30 days' free trial. NOW IS YOUR CHANCE! This is the watch you have wanted for years but have always considered beyond your reach. This astounding price holds good for this sale only. **Ask for W138.**

$15.00 — 14K SOLID GOLD

$35 REAL VALUE

Including solid gold bracelet. THE BARGAIN OF A LIFETIME! Guaranteed perfect timekeeper. On 30 days' free trial at this phenomenal price if you order from this ad.

JEWELED ADJUSTED REGULATED
Ask for WB138

SEND FOR NEW BARGAIN CATALOG—Full of surprises in diamonds, watches and jewelry. This 132 page bargain book will save you up to 100 per cent. Thousands of selections shown.

Wholesale Jewelers
B. GUTTER & SONS, 172 Nassau St., Division 158, New York

INSYDE TYRES

Inner Armor for automobile tires. Prevent punctures and blowouts. Double mileage of any tire, old or new. Easily applied without tools between casing and tube. Not ordinary relievers. Used over and over again in several casings. Will not heat or pinch. Cheaper and better than double tread, etc. Details free. Distributors and agents wanted. Sales guaranteed. Liberal profits. American Accessories Co. Dept. T-1752 Cincinnati, O.

Royal Wings

Most simple and popular wind deflector on market. They deflect Wind, Dust and Rain (adjustable for ventilating). **Attach them yourself.** No holes in glass. Beautify your car. Your choice of Bevel plate glass or Tri-plex non-shatterable glass—brackets highly nickel-plated. **FOR ANY CAR $25.00 PREPAID. GUARANTEED** in every way. State make of car. Write today. Big proposition to dealers.
ROYAL WINGS CO., 3219 S. Michigan Ave., Dept. A, Chicago, Ill.

EXPLOSION WHISTLE

You are gambling with death if you are not SURE your warning signal is absolutely dependable.

The warning device that cannot fail is the Buell Explosion Whistle. Equipment for ninety-six manufacturers. Over 200,000 in use. 10 year guarantee. In Single Tone or Chime. Buy from your dealer or write for interesting circular.

BUELL MANUFACTURING CO.
Cottage Grove at 30th CHICAGO

HILL ST. LOUIS, MO. says RUSH YOUR FURS

Don't wait for price lists. Don't wait for anything. Bundle up every fur you have and ship at once to **Hill Bros.** — the old, reliable house where you are **sure** of highest market prices, supreme grading and **No Commission Charged.**

READ THIS SPECIAL OFFER

On shipments amounting to $30.00 or more, we will, if requested, hold your furs separate and advise you our best price. If not entirely satisfactory, we will promptly return your furs to you. Could anything be fairer than that? **Note**—If you want your furs held separate, your request **must be enclosed with your furs.**

SHIP YOUR FURS TODAY

Take us up on this offer. Let us prove to you that Hill pays more for furs than any other house.

HILL BROS. FUR CO. 302 Hill Bldg. St. Louis, Mo.

No Money Down

10 Days' Trial

Elgin Watch

New, thin model Elgin watch, warranted movement in gold-filled case, 20-year guarantee.

Decide for yourself. If you keep it, this beautiful high class watch may be paid for at **less than 7 cents a day.**

20-Year Guaranteed Gold Filled Case

Chain and Knife FREE

A gold filled knife and chain, **absolutely free** with this offer. State if you wish a Waldemar (shown in cut), Dickens or vest chain.

Less Than 7c a Day

If you are pleased when the watch comes send only $5.50 as first payment. Then wear the watch for ten full days. If you do not consider it the greatest value in America, return it at our expense and your deposit will be refunded immediately. If you decide to buy, send $2.00 a month until $22.50 is paid.

Order Today —On Trial

Remember, you are not obligated to buy when you order on trial. Just send your name and address. No red tape or annoyance. State which chain you wish. This offer limited. Act now. Send your name today.

Our 128-page catalog shows more than 2000 bargains in Diamonds, Watches and Jewelry. Write for it now.

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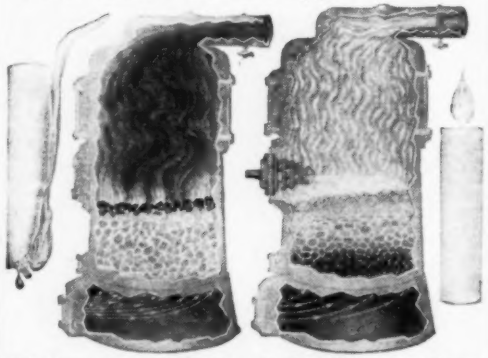
BE A DISTRIBUTOR
THE CROWN FUEL SAVER

Turns Smothered, Smoking Heating Plants Into

HOT BLASTS

Cuts Coal Costs 20% Or More



Rich Gases Unburned Wasted up the Chimney. Like Candle —WRONG WAY.

Pre-Heated Air injected turns gases into intense Heat. Like Candle—RIGHT WAY.

Start Your Own Permanent Business

Quick easy sales and big profits. One sale a day earns you $500.00 per month. Coal Famine creates tremendous demand. Every furnace owner a good prospect. Strong selling literature. Our splendid course of training insures success. Send for "Revelation in Heating." Portland, Rochester, Philadelphia, Pittsburgh, Omaha, St. Louis and other fortune making territory may be secured by prompt action. **CFS CO., 15 N. 10th Street, Richmond, Indiana.**

Oldest, Largest and Best Poultry Journal

4 MONTHS' TRIAL 25 cts.

Averages over 100 pages per issue—tells how to feed, house and breed; how to secure high egg production; how to hatch and rear poultry successfully. Established 1874. Only 25 cts. for 4 months —75 cts. for 1 year or $2.00 for 3 years. Stamps accepted.

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Trust your hatching to time tried and tested

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Incubators and Brooders

Used by the big money makers who stay in business year after year. Poultry Lessons Free. Booklet, "How to Raise 48 out of 50 chicks," 10 cents. Catalog Free. Write today.

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World's Best Poultry Books

Free Catalogue on Request!

Positively latest and most reliable profit-earning books on Houses, Fixtures, Feeding, Culling, Use of "Lights", Incubating, Brooding, Prolific Egg Yield, Back-Yard Poultry Keeping, etc., etc. Do not grope in dark! "Know your business." Post card or letter brings FREE catalogue. 32 pages.

Reliable Poultry Journal Pub. Co., Dept. 118 Quincy, Ill.

FREE This **FOOTBALL** is given to you for selling only 40 packs "Quality Brand Garden Seeds" at 10c per packet. Order today. SEND NO MONEY, WE TRUST YOU. When sold return $4.00 collected and the **FOOTBALL** is yours. Cash commission if preferred. Many other valuable presents. Catalogue with order.

NATIONAL SEED CO.

Dept. 83 **LANCASTER, PA.**

Bowlegged Men

Your legs will appear straight when you wear

Straightleg Garters

Combination hose-supporter and pantleg straightener — **Quickly adjusted to fit various degrees of bowlegs;** as easy to put on and comfortable to wear as any ordinary garter — **no harness or padded forms;** just an ingenious special garter for bowlegged men — improves appearance wonderfully. Wearers are enthusiastic. You will be too. Write for free booklet, mailed in plain envelope.

S-L GARTER COMPANY
855 Trust Co. Bldg. DAYTON, OHIO

TOBACCO
Or SNUFF HABIT
Overcome or NO PAY!

No matter whether used in pipe, cigarettes, cigars, chewed, or used in the form of snuff. Superba Tobacco Remedy contains nothing injurious, no dope, poisons, or habit-forming drugs. Guaranteed. Sent on trial. If successful, costs you one dollar. If it fails, or if you are not perfectly satisfied, costs you nothing.

Write for full remedy today.

SUPERBA COMPANY, M-19, BALTIMORE, MD.

A Home-Made Gray Hair Remedy

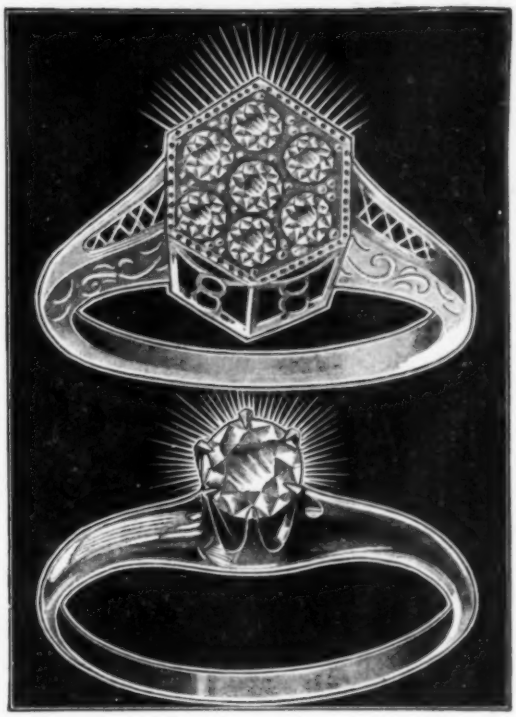
You can prepare a simple mixture at home that will gradually darken gray hair, and make it soft and glossy. To a half-pint of water add 1 ounce of bay rum, a small box of Barbo Compound and ¼ ounce of glycerine.

These ingredients can be bought at any drug store at little cost, or the druggist will put it up for you. Apply to the hair twice a week until the desired shade is obtained. This will make a gray-haired person look many years younger. It is easy to use, does not color the scalp, is not sticky or greasy and does not rub off.

DEAFNESS IS MISERY

I know because I was Deaf and had **Head Noises** for over 30 years. My invisible Antiseptic Ear Drums restored my hearing and stopped Head Noises, and will do it for you. They are Tiny Megaphones. Cannot be seen when worn. Effective when Deafness is caused by Catarrh or by Perforated, Partially or Wholly Destroyed Natural Drums. Easy to put in, easy to take out. Are "Unseen comforts." Inexpensive. Write for Booklet and **my sworn statement** of how I recovered my hearing.

A. O. LEONARD, Suite 226, 70 5th Avenue, New York City



Diamond Bargains

Just Released

Unusual conditions force us to offer many great bargains in diamonds. Through owners failure to pay money loaned, we are offering values to the public so low that no retailer can match them even at 40 per cent more Send the coupon at once for our great bargain bulletin free.

Send Coupon Now for Great Diamond Loan Bulletin — Free

Send the coupon right away for our splendid bargain bulletin of marvelous diamond values We have loaned money on valuable diamonds for more than one-third of a century. See for yourself how much cheaper you can buy from us Send coupon today. Don't wait.

Send your name only for the latest bargain bulletin. Lists newest bargains in diamonds. Fresh from the press. Great values just released. But only a few Write in now before you are too late Hurry

L. Goldman's Sons
Goldman Building
Dept 1359
Kansas City, Mo.

L. Goldman's Sons
Goldman Building
Dept. 1359
Kansas City, Mo.

Please send me at once without any obligation to me your catalog and latest Diamond Loan Bulletin.

Name.....

Address.....

R. F. D......

City..... *State*.....

Cut your Own Hair!

It Can Be Done—YOU Can Do It

THOUSANDS ARE DOING IT; we know because we have thousands of unsolicited testimonials from **satisfied users,** that we have been successful in developing a simple device—**adjustable** which enables the user to quickly and accurately CUT HIS OWN HAIR with a process of simply combing it with a COWAN MASTER BARBER HAIR CUTTER.

Free Trial Offer

You can cut your own hair just as easy as you can shave your face. No more taking "turns" at the barber shop. Today men shave themselves and cut their hair at home. It's part of the regular toilet of particular people to trim the hair a little every few days. MOTHERS keep the children's hair trim and neat with a

COWAN
MASTER BARBER
HAIR CUTTER

The Cowan is made **Scientifically Correct, Sanitary** and for **Universal Use** for men, boys and Mothers. Capable of any work a barber can do—quickly turned into a high class SAFETY RAZOR—a whole barber equipment. Made of solid Nickel Silver—simple and durable construction. Takes place of two pairs of clippers, scissors, comb and razor. Shaves back of neck, face, trims the beard or mustache and cuts the hair in any style desired. Sold only under our MONEY BACK GUARANTEE.

FREE! Send No Money. Just send your name and address today for information regarding our **Free Trial Offer** how you can try the COWAN in your own home for thirty days at our risk.

DEALERS and AGENTS WANTED

DEALERS and AGENTS in every country in the **World** are asking for The Cowan. Why not YOU?

Cowan Hair Cutter Co.
Dept. 701
Kansas City, Mo., U.S.A.

Please Mention Popular Mechanics

Save Money on Your Clothes

WE MAKE EVERY SUIT TO YOUR INDIVIDUAL MEASUREMENTS and from the exact cloth that you select, from the style that pleases you most. The finished garments are sent to you, **all delivery charges prepaid.** If the suit does not fit and satisfy you in every way—send it back to us and we will refund your money promptly and cheerfully.

WRITE TO-DAY for our big sample book. We will gladly send it to you FREE.

You will be able to make from $20.00 to $50.00 per week, extra, by just taking orders from your friends, relatives and acquaintances in your spare time.

Republic Woolen Co. Dept. C515 CHICAGO, ILL.

SALESMEN

TIRED OF THE ROAD

If you are looking for a position with less traveling, if you are big enough to investigate with an open mind something "different" where you can capitalize your selling ability, a proposition that is one hundred per cent clean, honest and attractive, get our proposition to Organizers to establish new lodges and appoint Deputies working for you. PAYS BIG—THE LIMIT LIES WITH YOURSELF. $10,000 a year and up possible. Let us show you.

FRATERNAL ORDER BEAVERS
Liberty Building Philadelphia, Pa.

Send No Money

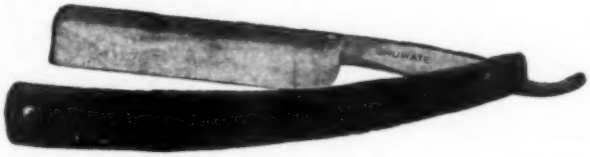
Profit Smashing Bargain—Just send your name, address, size and color for 6 pairs of these handsome, durable, genuine Duo-Web silk socks. Pay only $3.19 for six pairs on arrival. **GUARANTEED $6.00 VALUE.** Wonderful quality, extra heavy silk. Elastic ribbed top. Double toe and sole, high spliced heel. Choice of brown or black. Fast colors. Write today for this astounding offer. Limited quantity. Only 6 pairs to a customer. Shipped delivery charges paid. Pay only $3.19 on arrival. Money back if you can match them for $6.00.

Dept. L 2212
BERNARD-HEWITT & CO., 900 W. Van Buren, CHICAGO

SHUMATE Razor

Written Guarantee with Each Razor

SHUMATE RAZORS are so good that we guarantee them for life. Here's the reason: The blade is made from tungsten alloy steel, which takes a keener edge than any other steel can -- and holds it. You can use a SHUMATE for years without honing. The secret of this wonderful steel is ours alone, and we guard it jealously.



Buy a SHUMATE RAZOR and use it, not only a few times, but as long as you like. If you decide after an exacting trial, that you don't like it, we'll exchange it for a new one without a word.

Ever recline in a barber's chair and almost go to sleep as you experienced that delightful, soothing sensation when his razor swept your face clean? And have you said to yourself "I wish I had a razor that would perform like that"? A SHUMATE will do it and - - keep on doing it.

$2.50 Send us $2.50 and the SHUMATE Barber razor will be sent to you postpaid. If your beard is extra wiry, we recommend our $4.00 SHUMATE RAZOR, specially ground for this purpose. In remitting, give us your dealer's name, and a chamois lined, rust-proof case will be included with your razor.

SHUMATE RAZOR COMPANY, 883 CHESTNUT ST. ST. LOUIS, U. S. A.

Established 1884 Capacity 10,000 Razors Daily

SEND NO MONEY

All Leather Work Shoes

$1.98

Offer Limited—Write Today

Here's an offer that will "open your eyes!" A pair of fine durable work shoes for $1.98 and a pair of super-quality all-leather Dress Shoes for $4.98—both pairs for $6.96. You send no money with your order. You wait until you have the shoes in your hand before you pay out a penny of your money. Read and see why we can make such an astounding offer. We make this unheard of offer to introduce to **you** the price-smashing bargains in shoes, groceries and general merchandise in our catalog. When you see how we save you money and give prompt service and fair dealing, we know you will buy from us again and again and will recommend us to others.

Special Combination Offer

With your order you get *both* a pair of these extra durable Tan Work Shoes (see top cut) made of genuine, long-wearing leather, with heavy solid soles, extra stitched and reinforced against wear and tear throughout—*and* a pair of these splendidly made Black Dress Shoes (see bottom cut) cut from high grade black leather, in the popular Blucher last, with extra quality leather soles—dress shoes that ordinarily sell for $7 and $8—**both pairs** for this extraordinary price of $6.96! But—*Order Quick*—our stock, big as it is, won't last long at these sensational prices.

Order Today! This offer is bona-fide and on the level. We know you will be wonderfully pleased and surprised when you get the shoes, and remember, you must *not* send a cent with your order. Also, remember, **we cannot sell either pair separately.** Send your name, address and shoe size. When shoes arrive, simply pay **$6.96** for *both* pairs, and postage fees. Then, examine the shoes, try them on and if you are not entirely satisfied, return the shoes to us and we will refund your money. You run no risk.

Consumers Stores Company, Dept. 1779 **1014 West Congress St., Chicago, Ill.**

FREE
For 10 Days Wear

Send no money. Just ask us to send you either of these wonderful, dazzling, genuine Tifnite Gem rings to wear for 10 days. If you can tell it from a diamond, send it back. Tifnite gems stand every diamond test.

No. 1. Solid gold mounting. Eight-claw design flat wide band. Almost a carat, guaranteed Tifnite gem.

No. 2. Solid gold Ladies' newest mounting. Has a guaranteed genuine Tifnite Gem, almost a carat.

No. 3. Solid gold six-prong tooth mounting. Guaranteed genuine Tifnite Gem, almost a carat in size.

In sending, send strip of paper fitting around second joint of finger. If satisfied upon arrival send $4.50—then $3 monthly until the price, $16.50, is paid for either one. Otherwise return the ring within ten days and we will refund any payment made. This offer is limited. Send while it holds good.

The Tifnite Co., Dept. 1117 Chicago, Ill.

Please Mention Popular Mechanics

2 FLANNEL SHIRTS $3.69

Direct From Factory

SEND NO MONEY

Two wonderful Susquehanna Broadcloth Flannel Shirts—only $3.69. Direct from factory. No middlemen's profits. Would cost $6 or more elsewhere. Perfectly tailored. Cut extra full. Comfortable fitting. Winter weight. Soft turn down collar. Two extra strong, large pockets. Double stitched throughout. Thoroughly shrunk. For work or semi-dress. An amazing bargain. Send no money. Pay postman only $3.69 plus postage after arrival. Then try them on. If not pleased, return at our expense; your money returned at once. Order by number FS213. State size. Specify gray or blue. Only two shirts to a customer on this special offer.

WAREWELL COMPANY

Dept. FS213 Philadelphia, Pa.

1921 Model Warranted Watch $2.95

to introduce our watches. Thin model, beautifully polished silveroid case. Men's and women's size. Fitted with high grade movement, fully tested. Stem set and stem wind.

EVERY WATCH GUARANTEED

$2.95

C.O.D.

Send us your name and address plainly written, at once. We'll send this beautiful watch by return parcel post. Pay postman only $2.95. Test this 1921 time keeper in every way. If not satisfied return it. We'll refund your money. Send your order TODAY. Special offer: Gold filled chain $1.00 extra.

Cambridge Watch Co., 1219 Cambridge Bldg., Chicago

MARINE ENGINES

3 H. P. single and 6 H. P. double cylinder, all iron or copper jacket, aluminum base, light weight, for canoes and small boats.

THE WATKINS MOTOR CO., 828 W. 6th St., CINCINNATI, OHIO

AGENTS: $6 a Day

taking orders for New Kerogas Burner. Makes any stove a gas stove. Burns kerosene (coal oil). Cheapest fuel known. Fits any stove.

$40 a Week for Taking Only 2 Orders a Day

No experience necessary. No capital required. Work full or spare time. Easy to get orders on account of high price of coal. Get started at once. Big season now on. Write for demonstrating sample.

THOMAS MFG. CO. B-248 Dayton, Ohio

Be an Expert Mechanic Make More Money

THE automobile mechanic who gets the money is the man who can spot the trouble and fix it promptly. There is only one way to be an expert and that is to thoroughly understand your job; you can't get this understanding working in a factory or tinkering around a garage.

Over half the men in the SWEENEY MILLION DOLLAR SCHOOL came here because, they were so advised by some friend, owning a garage or automobile agency or repair shop, who, himself, went through the Sweeney School.

Get the BEST

When you pay for an education get the best. It is common sense to come to a leader—so recognized. Remember you can't get the *Sweeney System* any place else and the Sweeney System has been officially approved by the United States Government in sending me over 5,000 men to train for army mechanics. Over 35,000 graduates prove that this school is a success.

The Sweeney System

Consists in training you by actual experience on all types of gas engines—tractors—automobiles—trucks—aviation engines. Over $350,000 worth of equipment is required for this work. As Barney Oldfield said: "Why Sweeney—this isn't so much a school as a city of shops." We teach with tools, not books — and our men know how because they actually do the work.

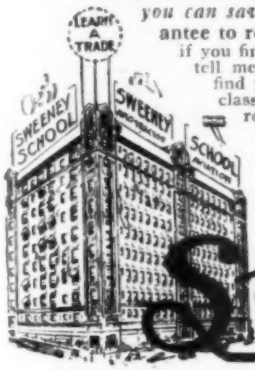
Learn in 8 Weeks

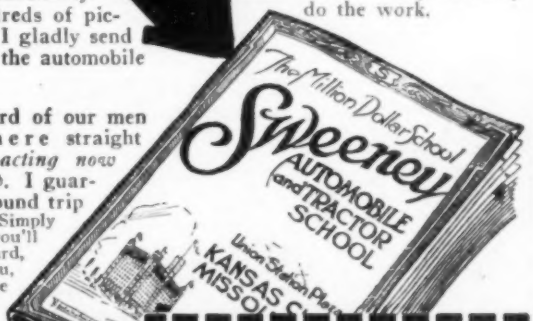
If you really want to be an expert mechanic and work on modern machinery the 8 weeks' course at the Sweeney School offers you a wonderful opportunity. Write today for my big free catalog showing hundreds of pictures of men at work. This book costs me $1.00 but I gladly send it free. It will open your eyes to the possibilities of the automobile business. Get your copy today.

Get on a Train—Let's Go!

One-third of our men come here straight off—without long correspondence. *By acting now you can save $50 on a life scholarship.* I guarantee to refund your railway fare round trip if you find a single misrepresentation. Simply tell me when you will arrive and you'll find your name on the bulletin board, class assigned, tools ready for you, rooms waiting you. Only white students accepted. *Pack your grip and let's go.*

Earnestly yours,
E. J. SWEENEY,
President.





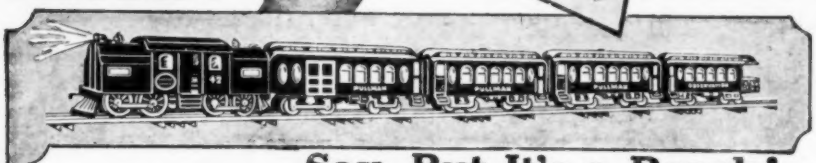
LEARN A TRADE—
Sweeney
SCHOOL OF AUTO-TRACTOR-AVIATION
312 SWEENEY BLDG. KANSAS CITY, MO

EMORY J. SWEENEY, President
312 Sweeney Building, Kansas City, Mo.
Send me free your 72-page catalog and Sweeney School News and tell me of the opportunities in the auto and tractor business.

Name .....
Address .....
I'm coming .....

BIG CATALOG 32 Pages Printed in Bright Colors!

FREE!



Say, But It's a Peach!

Page after page of dandy Lionel trains, locomotives, electric lighted stations and tunnels, lamp posts, telegraph poles, semaphores, etc. All in reds, blues, yellows and greens—just as they'll look to thousands of happy boys this Xmas. So real you can almost hear the trains rushing by, and see the semaphores working up and down, and "stevies" loading freight 'n' everything! Gee, it's exciting to run a railroad—if it's a LIONEL! That catalog's sent free. Get one now so you and Dad can select your gift early. Sold by department and toy stores, electrical, hardware and sporting goods dealers. Write us your dealer's name, if he hasn't them, and we will see that you are supplied.

THE LIONEL CORPORATION, 50-P East 21st St., NEW YORK CITY

LIONEL ELECTRIC TOY TRAINS & Multivolt Transformers

F

For CHRISTMAS

This Airplane

Boys, if you want a real Christmas present, get Dad to buy you a Lawrence Airplane Knockdown Construction Set, and build your own silk covered scale model that looks and flies like a real airplane. Lawrence Constructions are different from and build snappier, more accurate models than any on the market. Designed by expert fliers—are not merely a box of material but a complete set of finished parts shaped and cut to exact form and size—simplest to assemble. Require no wire or nails. Officially adopted as part of course at Camp Roosevelt and by other aviation schools. Complete blue print drawings and instructions go with each set. If your dealer does not sell Lawrence Airplanes, send us your check or money order together with his name and we will send you any of the following Lawrence Construction Sets in time for Christmas.

Lawrence Twin Push	$5.00
Lawrence Military Monoplane	6.50
Lawrence Military Biplane	8.00
Lawrence Naval Seaplane	10.00

Twin Push has 30 inch wing spread—other three models have 36 inch wing spread.

LAWRENCE

Lawrence Airplane Model & Supply Company
Dept. 439, 570 W. Van Buren Street, Chicago

$3.00 —A— MONTH!

19 Jewel Railroad Quality

This month's bulletin smashes the terms—boosts the quality, lowers the price. No delay—No security—no interest. We trust you.

SENT ON APPROVAL!

You do not risk a penny. This beautiful watch will be sent you on 30 days Free Trial. Our special price is rock bottom. We guarantee to refund your money if you can beat it for spot cash. A new deal for square people. Write now for this big special offer. A postal will do.

Adjusted
—To Positions
—To Temperature
—To Isochronism
—To The Second
—16 Size 25 Year Gold Filled Case.

HARRIS-GOAR COMPANY
Dept. 364 KANSAS CITY, MO.

Special LOW Price—ACT Quick

Write me immediately! I am ready to make you the lowest price offer ever made on a sanitary, scientifically designed, handsomely constructed indoor chemical closet. Write right now and learn WHY I can beat all price competition and get a

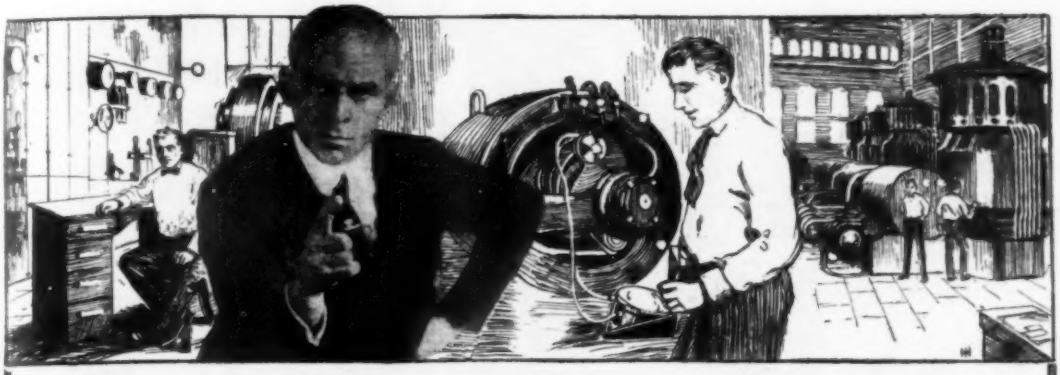
Detroit Indoor CLOSET

ON 30 DAYS' FREE Trial

Greatest farm and town-home convenience ever devised. Insures complete privacy. Comfort winter and summer—positively guaranteed. If not completely satisfied return it and I will pay charges both ways.

Write for NEW Low Price Offer At Once

Albert Coleman, Pres.
DETROIT INCUBATOR CO.
Dept. 114 Detroit, Mich.



Electricity Needs You

I WILL TRAIN YOU AT HOME

Stop right here. You've found YOUR opportunity! The war is over, and the Electrical Business is in for a tremendous increase. But it needs more trained men—at big pay. By my **Home Study Course** in **Practical** Electricity I can train you for these positions paying

$65 to $175 a Week and Up

You've always had a liking for Electricity and a hankering to do electrical jobs. Now is the time to develop that talent; there's big money in it. Even if you don't know anything at all about Electricity you can quickly grasp it by my highly successful method of teaching. You will find it intensely interesting and highly profitable. I've trained and started hundreds of men in the Electrical Business, men who have made big successes. YOU CAN ALSO.

Be a CERTIFICATED ELECTRICIAN

What are you doing to prepare yourself for a real success? At the rate you are going where will you be in ten years from now? Have you the specialized training that will put you on the road to success? Have you ambition enough to **prepare** for success, and get it?

You have the ambition and I will give you the training, so **get busy.** I am offering you **success** and all that goes with it. Will you take it? I'll make you a CERTIFICATED ELECTRICIAN. I am Chief Engineer of the Chicago Engineering Works and can train you better than anybody else. I will instruct and train you, give you my personal advice and help whenever you need it, and assist you in every way to the biggest, possible success.

Earn Money While Learning And I'm offering you something you can use **now.** Early in my **Home Study Course** I show you how to begin making money in Electricity, and help you get started. And with my course I am also giving, right now,

FREE BIG ELECTRICAL OUTFIT

A fine outfit of Electrical Tools, Instruments, Materials, etc., absolutely FREE to every student. I will also send you FREE and fully prepaid—Proof Lessons to show you how easily you can learn Electricity and enter this splendid profession by my new, revised and original system of Training by Mail.

Another Big Advantage We have large splendidly equipped Electrical Shops where you can come at any time for special instruction without charge. No other correspondence school can give you this.

And Still More In addition to all this I am giving right now, absolutely free to every student who answers this ad, a **big, truly valuable surprise,** that I cannot explain here. **Tear out this ad as a reminder, and write me today!**

Valuable Book Free My book, "How to Become an Expert Electrician," has started many a man on the way to fortune. I will send a copy, free and prepaid, to every person answering this ad.

Do It Now Good intentions never get you anywhere. It is action, alone, that counts. NOW IS THE TIME TO ACT.

CHIEF ENGINEER COOKE

CHICAGO ENGINEERING WORKS

Dept. 510Y 1918 Sunnyside Ave. CHICAGO, ILL.

CHIEF ENGINEER COOKE

Chicago Engineering Works Dept. 510Y,
1918 Sunnyside Avenue
CHICAGO, ILL.,

DEAR SIR: You may send me entirely free and fully prepaid, a copy of your book, "How to Become an Expert Electrician," and particulars about your **Home Study Course in Electricity.**

Name.....

Address.....

City.....*State*.....

Extra Special Offer

To a limited number of ambitious men, anxious to learn drafting, I will give this Drafting Outfit absolutely Free as soon as they become my students. I make this offer because Draftsmen are wanted badly in all industries.

Calls are sent out every day for men to fill steady positions paying from $250 to $300 per month. The work is done in a clean, pleasant office and leads to higher executive positions. Write today without fail.

Chief Draftsman *Will Train You Personally!*

Chief Draftsman will train you personally on practical drafting room work, giving you his personal attention and train you *until* you are qualified and experienced as a first class Draftsman and *until* placed in a first class, permanent position drawing a first class Draftsmen's salary

Chief Draftsman Dobe
4001 BROADWAY
Dept. 9359, Chicago, Ill.

Without any obligation on me whatsoever, please mail your book, "Successful Draftsmanship," and full particulars of your liberal "Personal Instruction" offer to a few students. It is understood that I am not obligated in any way whatever.

Name.....

Address.....

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$300.00 a Month

and more is being paid to men with the training and experience such as I give.

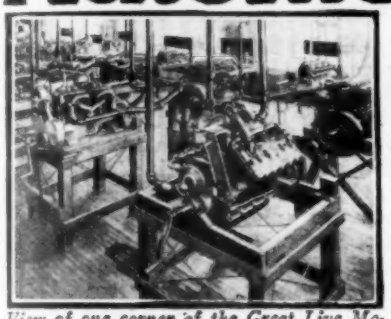
Mail Coupon for Free Book

Send for my new big book, "Successful Draftsmanship," today. It is free. Send for it right away. Fill in and mail the coupon. No obligation.

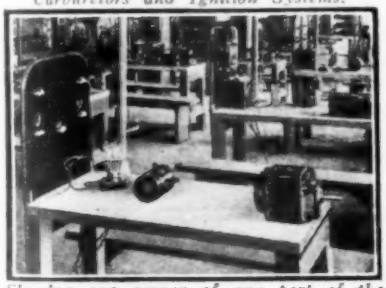
Chief Draftsman Dobe, Dept. 9359 4001 Broadway **Chicago**

Learn the World's Best Paying Business in the Great Rahe School

Automobile Tractor Airplane



View of one corner of the Great Live Motor Department—all types and sizes of motors running on their own power for real "trouble shooting" practice—all types of Carburetors and Ignition Systems.



Showing one corner of one part of the Lighting and Starting Equipment Department. All types of Lighting and Starting Systems, each mounted separately.

Just one small section of the great new equipment recently installed in the Ignition Department. Every type of latest ignition devices, magnetos, coils, distributors, batteries and instruments of all types and kinds for testing and recording the operations of all equipment.

Don't Stay a Grease Monkey!

If you are working at the Automobile Mechanic Business and not getting the top pay of a real expert you are cheating yourself every day. As a "Grease Monkey" you stand little chance ever to get to the top, no matter how hard you work. Come to the Big Rahe School. 300 Master Mechanic Instructors and Assistants who are high-paid to train you to earn top pay at once after you leave school. You do every kind of job with tools in your own hands under men who have been specially selected for their unmatched ability to train you easily and thoroughly.

Learn in 6 to 8 Weeks

at this great school. You learn better here in weeks than in years in any shop or factory. Thousands of men come to the Rahe School every year who have had 2 to 5 years' work in garages, shops and factories. They come here finally to learn right. You learn quicker and cheaper than in any shop or factory. The success of nearly 40,000 Rahe graduates proves this.

Rahe trained men now in business for themselves in every section of the country are always calling for more Rahe trained men than I have students. Over 50,000 places right now calling for new shops and sales Agencies.

Be Your Own Judge

Come and see for yourself the greatest assemblage of up-to-date equipment ever got together for practical training purposes. Ideal working and living conditions. Four (4) great buildings. Flood daylight construction. Plenty of ventilation and floor space. Big tractor farm; big flying field.

Catalog Free

If you can't come and see, let me send you the proof. Write today for my 84-page Free Catalog. Use the coupon below. It's handy. Or send post card.

HENRY J. RAHE, Dept. 2896, Kansas City, Mo.

MAIL THIS TODAY!

HENRY J. RAHE,
Dept. 2896, Kansas City, Mo.

Please send me free 84-page catalog, giving proof of graduates' success and showing the many opportunities open now.

Name.....

Address.....

Renew *with* Johnson's Wood Dye

JOHNSON'S WOOD DYE is for the artistic coloring of woods. With it inexpensive soft woods such as pine, cypress, fir, etc. may be finished so they are as beautiful as hardwood. Johnson's Wood Dye is very easy to apply—it goes on easily and quickly without a lap or a streak.

JOHNSON'S WOOD DYE has many uses, for both the artisan and amateur. ***Architects*** and ***contractors*** specify it for coloring woodwork and flooring in new buildings. ***Painters*** and ***decorators*** use it with equal satisfaction on new and old woodwork of all kinds. ***Laymen*** delight in it for doing over old furniture and for coloring reed and wicker baskets, etc. ***Manual training teachers and pupils*** use it for finishing their models. ***Upholsterers, furniture repairers*** and ***cabinet makers*** find it "just the thing" for their work—old and new.

Instruction Book Free

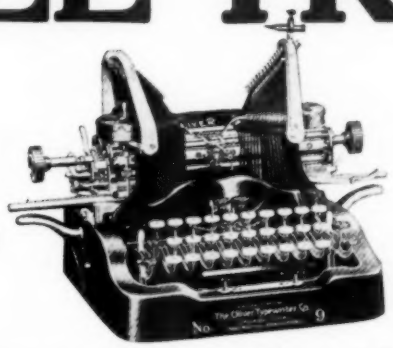
Write for our beautiful new thirty-two page color book "The Proper Treatment for Floors, Woodwork and Furniture"—just off the press. We will gladly send it free and postpaid. **Address Dept. P. M.**

S. C. JOHNSON & SON, Racine, Wis., U.S.A.
"The Wood Finishing Authorities"
Canadian Factory—Brantford

FREE TRIAL

Keep It

For $4.00 per Month



Or Return It At Our Expense

The Oliver Typewriter—Was $100—Now $64

The Guarantee of a $2,000,000 Concern that it is the Identical Model

Be your own salesman and save $36. You get the identical typewriter formerly priced $100—not a cent's alteration in value. The finest, the most expensive, the latest Oliver Model. Old methods were wasteful. During the war we learned that it was unnecessary to have great numbers of traveling salesmen and numerous, expensive branch houses throughout the country. We were also able to discontinue many other superfluous, costly sales methods. You benefit by these savings.

Brand New—Never Used

Do not confuse this with offers of earlier models or second-hand. Note the signature of this advertisement. This is a $2,000,000 concern.

We offer new Olivers at nearly half price because we have put typewriter selling on an efficient, scientific basis.

You now deal direct—sell to yourself, with no one to influence you. This puts the Oliver on a merit test.

The entire facilities of this Company are devoted exclusively to the production and distribution of Oliver Typewriters.

You Save $36

This is the first time in history that a new standard $100 typewriter has been offered for $64. Remember, we do not offer a substitute model, cheaper nor different. But the same splendid Oliver used by the big concerns. Over 800,000 Olivers have been sold.

We ship direct from the factory to you. No money down—no red tape. Try the Oliver Nine at our expense. If you decide to keep it, send us $4.00 per month. If you return it, we even refund the outgoing shipping charges. You are not placed under the slightest obligation. That's our whole plan. We rely on your judgment. We know you don't want to pay double, and who wants a lesser typewriter? You may have an Oliver for free trial by checking the coupon below. Or you may ask for further information.

An Amazing Book

All the secrets of the typewriter world are revealed in our startling book entitled "The High Cost of Typewriters—The Reason and the Remedy"—sent free if you mail the coupon now. Also our catalog. Order your free trial Oliver or ask for further information at once.

CANADIAN PRICE, $82

The OLIVER Typewriter Company

1099 Oliver Typewriter Bldg., Chicago

NOTE CAREFULLY—This coupon will bring you either the Oliver Nine for free trial or further information. Check carefully which you wish.

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